SEATTLE CENTER ARENA RENOVATION PROJECT

VOLUME 1:
Draft Environmental Impact Statement

PREPARED FOR
City of Seattle Department of Construction and Inspections

IN COOPERATION WITH
Seattle Center, Office of Economic Development,
and Seattle Department of Transporation

PREPARED BY
Environmental Science Associates

APRIL 2018

Seattle Department of Construction & Inspections

seattlecenter

Seattle Office of Economic Development

SDOT
Seattle Department of Transportation

April 23, 2018

Seattle Center Arena Renovation Project Draft Environmental Impact Statement

Dear Affected Agencies, Organizations, and Interested Parties:

The City of Seattle (City) is proposing to renovate the existing KeyArena at Seattle Center to provide a modern multi-purpose entertainment and sports center that will host concerts, sporting events, family shows, community-oriented events, and numerous other events, and that could accommodate a professional National Hockey League (NHL) and/or National Basketball Association (NBA) franchise. The proposal would also continue to accommodate current uses including the Seattle Storm Women's National Basketball Association (WNBA) franchise. For the purposes of this EIS, the renovated arena is referred to as the "Seattle Center Arena."

The Seattle Department of Construction and Inspections (SDCI) is the Lead Agency under the State Environmental Policy Act (SEPA) for the proposal and has prepared this Draft Environmental Impact Statement (Draft EIS) to analyze potential environmental impacts resulting from the proposed renovation of KeyArena. Seattle Center, the Office of Economic Development (OED), and Seattle Department of Transportation (SDOT) are consulting agencies and partners in the EIS process for the Seattle Center Arena Renovation Project. The City proposes to enter into a lease and development agreement with a private developer, Oak View Group, LLC (OVG), who would design and obtain permits for the renovation and operation of the arena during the lease term.

The scope of this Draft EIS has been determined in accordance with the Seattle SEPA Ordinance (SMC 25.05). A public notice was issued on September 7, 14, and 18, 2017, stating that the project would require an EIS and inviting public and agency comment on the scope of the Draft EIS. On September 28, 2017, a public meeting was held at Seattle Center to provide opportunity for the public to discuss and identify probable significant environmental impacts that should be addressed in the Draft EIS. A total of 41 comment letters and oral testimonies were received during the scoping period and were used by SCDI to inform the issues and alternatives evaluated in the Draft EIS.

Three alternatives are analyzed in this Draft EIS, including the No Action Alternative, Alternative 1: The Oak View Group (OVG) Proposal, and Alternative 2: Modified Proposal.

The Draft EIS describes the affected environment, potential impacts of the three alternatives, and mitigation measures for the following topics: land use, transportation, earth, historic and cultural resources, recreation, noise and vibration, visual resources, air quality and greenhouse gases, public services and utilities, plants, and cumulative impacts. Key environmental issues are primarily related to potential construction and operations impacts to traffic and transportation, as well as historic and cultural resources, noise and vibration, and visual resources.

The City is requesting review and comment on this Draft EIS from members of the public, organizations, and local, state, and federal agencies. The City will consider all comments provided during the 45-day comment period on the Draft EIS, which ends on June 7, 2018. A public hearing will be held on May 14,

2018 at 6:30 PM at the Seattle Center Armory Loft 2, with an open house beginning at 6:00 PM. Responses to comments will be provided in the Final EIS, anticipated for publication in late summer of 2018. The comments may result in revisions or clarifications to the Draft EIS.

Further information is available at the Seattle DCI webpage: http://web6.seattle.gov/dpd/edms under Permit and Property Records for Project Number 3029061 or at http://www.seattle.gov/arena.

Thank you for your interest in the Seattle Center Arena Renovation Project.

Sincerely,

John Shaw

John Shaw
Senior Transportation Planner
Seattle Department of Construction and Inspections

FACTSHEET

Project Name

Seattle Center Arena Renovation Project - Project Number 3029061

Proposed Action

The Proposed Action is to renovate KeyArena into a modern multipurpose arena to accommodate concerts, entertainment, community-oriented events, and sports events, including meeting National Basketball Association (NBA) and National Hockey League (NHL) standards, as well as continuing current uses.

Project Proponent

City of Seattle

SEPA Lead Agency

Seattle Department of Construction and Inspections (SDCI)

SEPA Responsible Official

Nathan Torgelson, Director

Date of Issue

April 23, 2018

Public Comment Period

This Draft Environmental Impact Statement (Draft EIS) will be available for a 45-day public comment period. Comments must be received or postmarked by June 7, 2018.

Date Comments are Due

June 7, 2018

Comment Submittal and Contact Information

Comments can be sent by email to: prc@seattle.gov

Written comments can be mailed to:

Seattle Department of Construction and Inspections, PRC
Attention: Public Resource Center or John Shaw
700 5th Ave, Suite 2000
P.O. Box 34019
Seattle, WA, 98124-4019

Public Hearing

A public hearing will be held to receive comments from the public and interested parties on the Draft EIS. It will be held at:

May 14, 2018 6:00 PM to 9:00 PM

Armory Loft 2
Seattle Center
305 Harrison Street, Seattle WA 98107.

- A court reporter will be available to receive oral testimony.
- An Open House will begin at 6:00 PM, followed by public comments beginning at 6:30 PM.

Document Availability

The Draft EIS is available online at or at http://www.SeattleCenterArenaEIS.org, http://www.seattle.gov/arena, and the Seattle DCI webpage: http://web6.seattle.gov/dpd/edms under Permit and Property Records for **Project Number 3029061.**

Printed copies of the Draft EIS are available for review at no charge at:

SDCI Public Resource Center
700 5th Ave, Suite 2000
Seattle, WA 98124
*Open 8:00 AM to 4:00 PM on Monday, Wednesday, and Friday, and 10:30 AM to 4:00 PM on Tuesday and Thursday.

Seattle Public Library, Central Library
1000 4th Ave
Seattle, WA 98104

Seattle Public Library, Queen Anne Branch
400 W Garfield Street
Seattle, WA 98119

For questions or to obtain a copy of the document contact SDCI Senior Transportation Planner, John Shaw at: john.shaw@seattle.gov, 206-684-5837.

Permits, Licenses, and Approvals Likely Required for Proposal

- Permitting for renovation of the arena infrastructure, buildings and other related improvements, and associated permits for all other land-altering, building, and construction for the proposed project, potentially include: Master Use Permit (MUP), Demolition Permits, Building/Grading/Shoring Permits, Mechanical Permit and Electrical Permits, Significant Structure Term Permit, Tree and Vegetation Removal Permit, Street Improvement Permits, Street Use Permits, and Utility Relocation and Development Permits.
- Lease Agreement, Development Agreement, and Seattle Center Integration Agreement.
- Possible night-time construction work pursuant to the Seattle Noise Control Code (SMC 25.08).
- Possible variances or exceptions from the Land Use Code for curb cuts (SMC 23.54), signage (SMC 23.55), or other development standards.
- Possible Seattle Municipal Code amendments.
- Certificates of Approval from the Landmarks Preservation Board.

Authors and Contributors

A list of authors and contributors is provided in Chapter 15 of the Draft EIS.

Location of Background Materials

Background materials used in the preparation of this Draft EIS are listed in Chapter 16, *References*.

Timing of Additional Environmental Review

After the Draft EIS comment period concludes, SDCI (Lead Agency) will review and respond to comments. A Final EIS will be prepared that contains the responses to the comments and potential updates to the environmental document. SDCI anticipates releasing the Final EIS in summer 2018.

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ACRONYMS AND ABBREVIATIONS

A/NT	formerly known as Art/Not Terminal Gallery
ADA	Americans with Disabilities Act
AVO	average vehicle occupancy
BAAQMD	Bay Area Air Quality Management District
BMPs	best management practices
BRT	Bus Rapid Transit
CalEEMod	California Emissions Estimator Model
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CAPCOA	California Air Pollution Control Officers Association
CAV	connected autonomous vehicle
CC	Community College
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH4	methane
City	City of Seattle
CMP	Construction Management Plan
CNEL	Community Noise Equivalent Level
CO	carbon monoxide
CO2	carbon dioxide
CO2e	carbon dioxide equivalent
Corps	U.S. Army Corps of Engineers
CPP	(King) Countywide Planning Policy
CTS	Comprehensive Transportation Strategy
DAHP	Department of Archaeology and Historic Preservation
dB	decibel
dBA	A-weighted decibel
DMP	Demand Management Plan
DNS	Determination of Non-Significance
DR	Director's Rule
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Environmental Science Associates
FHWA	Federal Highway Administration
FICON	Federal Interagency Committee on Noise
FTA	Federal Transit Administration
GHG	greenhouse gas
GIS	geographic information system
GMA	Growth Management Act
GMPC	Growth Management Planning Council
GPS	global positioning system
GWMA	groundwater management area
HCM	Highway Capacity Manual
Hz	hertz
I-5	Interstate 5
IDP	Inadvertent Discovery Plan

IESNA	Illuminating Engineering Society of North America
in/sec	inches per second
ISA	International Sign Association
L10	noise levels equaled or exceeded 10% of a specified time period
L90	noise levels equaled or exceeded 90% of a specified time period
Ldn	day-night sound level
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design
Leq	equivalent sound level
Lmax	maximum sound level
LOS	Level of Service
M	(Richter) Magnitude
MEEP	Municipal Energy Efficiency Program
Metro	King County Metro
MMT	million metric ton
MOA	Memorandum of Agreement
MoPop	Museum of Pop Culture
MOU	Memorandum of Understanding
MOVES	MOtor Vehicle Emissions Simulator
MPH	miles per hour
MUP	Master Use Permit
MUTCD	Manual of Uniform Traffic Control Devices
Mw	Moment Magnitude
N2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NAVD88	North American Vertical Datum of 1988
NBA	National Basketball Association
NCAA	National Collegiate Athletic Association
NHL	National Hockey League
NMMP	Noise Management and Mitigation Plan
NO2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OED	Office of Economic Development
ORCA	One Regional Card for All
OVG	Oak View Group
P&R	Park and Ride
PAR	Protected Archaeological Resource
PM	particulate matter
PM10	particulate matter (less than 10 microns in diameter)
PM2.5	particulate matter (less than 2.5 microns in diameter)
PPV	peak particle velocity
PSCA	Puget Sound Clear Air Agency
PSRC	Puget Sound Regional Council
RCW	Revised Code of Washington
RFID	radio-frequency identification
RFP	Request for Proposal

ROG	reactive organic gases
RPZ	Restricted Parking Zone
SBCC	(Washington) State Building Code Council
SCL	Seattle City Light
SDC	Seattle Design Commission
SDCI	Seattle Department of Construction and Inspections
SDOT	Seattle Department of Transportation
SEPA	State Environmental Policy Act
SIFF	Seattle International Film Festival
SLU	South Lake Union
SMC	Seattle Municipal Code
SM-UP	Seattle Mixed-Uptown
SO2	sulfur dioxide
SoDo	South of Downtown
SPD	Seattle Police Department
SPS	Seattle Public Schools
SPU	Seattle Public Utilities OR Seattle Pacific University
SR	State Route
ST2	Sound Transit 2
ST3	Sound Transit 3
SWPP	Stormwater Pollution Prevention Plan
TAP	toxic air pollutant
TC	Transit Center
TCO	Traffic Control Officer
TCP	Transportation Control Plan
TDM	Transportation Demand Management
TMP	Transportation Management Program
TNC	Transportation Network Company
UDF	(Uptown) Urban Design Framework
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VdB	vibration decibel
VMT	Vehicle miles travelled
VOCs	volatile organic compounds
VPH	vehicles per hour
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WISAARD	Washington Information System for Architectural and Archaeological Records Data
WNBA	Women's National Basketball Association
WTD	(King County) Wastewater Treatment Division

1.0 INTRODUCTION & SUMMARY

1.1 INTRODUCTION

Seattle Center is a regional center for performance, arts, sports, and recreation. It is home to more than 30 arts, cultural, sports, and entertainment organizations, family attractions, and tourist amenities in the heart of Seattle (see Figure 1-1). The KeyArena building (which is a designated Seattle Landmark) is one of the most prominent structures on the Seattle Center campus and serves as a multi-purpose entertainment and sports venue hosting concerts, sports, and a variety of other events.

As owner of KeyArena, the City of Seattle (City) is proposing to renovate the arena to provide a modern multi-purpose entertainment and sports center that will host concerts, sporting events, family shows, community-oriented events, and numerous other events, and that could accommodate a professional National Hockey League (NHL) and/or National Basketball Association (NBA) franchise. The proposal would also continue to accommodate many current uses, including the Seattle Storm Women's National Basketball Association (WNBA) franchise. The proposed project also provides a number of upgrades, including improvements to enhance accessibility (such as improvements under the Americans with Disabilities Act [ADA]) and meeting a minimum Leadership in Energy and Environmental Design (LEED) threshold.

The City proposes to enter into a lease and development agreement with a private developer, Oak View Group, LLC (OVG). OVG would, at its cost, design and obtain permits for the renovation and operation of the arena during the lease term.

The Seattle Department of Construction and Inspections (SDCI) is the Lead Agency under the State Environmental Policy Act (SEPA) for the proposal and has prepared this Draft Environmental Impact Statement (Draft EIS) to analyze potential environmental impacts resulting from the proposed renovation of KeyArena. Seattle Center, the Office of Economic Development (OED), and Seattle Department of Transportation (SDOT) are consulting agencies and partners in the EIS process for the Seattle Center Arena Renovation Project.

In this EIS, the renovated arena is referred to as the "Seattle Center Arena" to distinguish it from the existing KeyArena and to reflect that a new name, as part of new sponsorship, is anticipated for the renovated arena.

1.2 PROJECT BACKGROUND

The building at Seattle Center known as KeyArena has gone through a number of renovations, name changes, and programming uses over the past 56 years. The structure was originally built for the 1962 Seattle World's Fair as the Washington State Coliseum and was paid for by the State of Washington. The Coliseum was designed by noted Seattle architect Paul Thiry, the lead architect for the World's Fair, and was home to the "World of Tomorrow" exhibit. After the World's Fair, the City purchased the Coliseum from the state, and the building underwent an 18-month conversion into a venue for sports, concerts, and trade shows, including installation of a seating bowl. The building became known as the "Seattle

Center Coliseum." An early tenant was the Seattle Totems of the Western Hockey League. In 1967, the Coliseum became the home of the Seattle SuperSonics ("Sonics"), an expansion franchise of the NBA. The Coliseum was a multi-purpose arena that also hosted concerts, trade shows, circuses, and other family events.

The Coliseum was renovated again in 1994/1995 to modernize the arena and keep it competitive for multi-purpose users and retain the NBA Sonics franchise as the anchor sports tenant. Increasing the capacity of the building within the same footprint and roofline required lowering the floor of the building by 38 feet. The superstructure of the old Coliseum was reused, and the roofline and curtain wall structure were preserved, with most of the significant changes occurring below grade. The project also included a 650-stall parking garage south of the Coliseum, called the 1st Ave N Garage. Construction for the renovation began in June 1994 and was completed in October 1995. Renamed "KeyArena" as part of a title sponsorship agreement with KeyBank, the renovated facility saw overall attendance of about 1.2 million annually.

In the mid-2000s, after failing to find public funding to renovate KeyArena to meet current NBA standards or to construct a new arena in the Seattle area, the Sonics moved to Oklahoma City. Thus, NBA programming at the Seattle Center ended before the 2008–2009 season. While its major tenant, the Sonics, no longer played at KeyArena, it continued to be a venue in Seattle for concerts and other types of shows. It is also home court for basketball teams, including the Seattle Storm and Seattle University and has continued to host a variety of sporting events, concerts, and other types of events. In 2016 and 2017, there was an average of 102 events and average annual expected attendance was approximately 640,000.

In 2015, the City Council commissioned a study of the existing condition of and future operating and renovation prospects for KeyArena (AECOM, 2015). The study found that the building, although "generally in good condition," was aesthetically dated and in need of modernization. Factors that affect the arena's utility included its small size, limited concourse space, and limited backstage, rigging, and loading facilities. Additionally, its configuration was deemed unsuitable for NHL hockey and unable to generate revenues comparable to other NBA arenas. The 2015 study analyzed alternative entertainment and recreation concepts for KeyArena, and found that "the potential revenue that could be generated from other attraction concepts is largely offset by the additional costs of basic operations and maintenance of the KeyArena facility," leaving the City at a deficit (AECOM, 2015, page 16). The study suggested that if sports or concert uses were not viable, the City could explore the possibility of demolishing the structure and using the site for other purposes.

Subsequently, the City decided to solicit proposals to renovate KeyArena (City of Seattle, 2017a). In response, the City received two submittals, one from OVG and one from Seattle Partners. To choose between them, the Mayor considered input from City review teams, the recommendation of a City Executive Team, and feedback from a Community Advisory Panel. On June 7, 2017, OVG's proposal was chosen and the City began negotiations to develop a Memorandum of Understanding (MOU) with OVG for the renovation. The City Council approved the MOU on December 4, 2017 (City of Seattle and OVG, 2017). The MOU outlines certain business terms upon which: (1) the City would offer a portion of KeyArena and the surrounding area for lease by OVG; and (2) OVG, as tenant, would seek the necessary permits and approvals and construct leasehold improvements and operate the arena. The "project site" as analyzed in this Draft EIS is defined as the proposed lease area, which consists of the area including and surrounding KeyArena, a parcel to the south that contains the Bressi Garage and the 1st Ave N Garage, and the location of a truck-loading access tunnel underneath Thomas St.

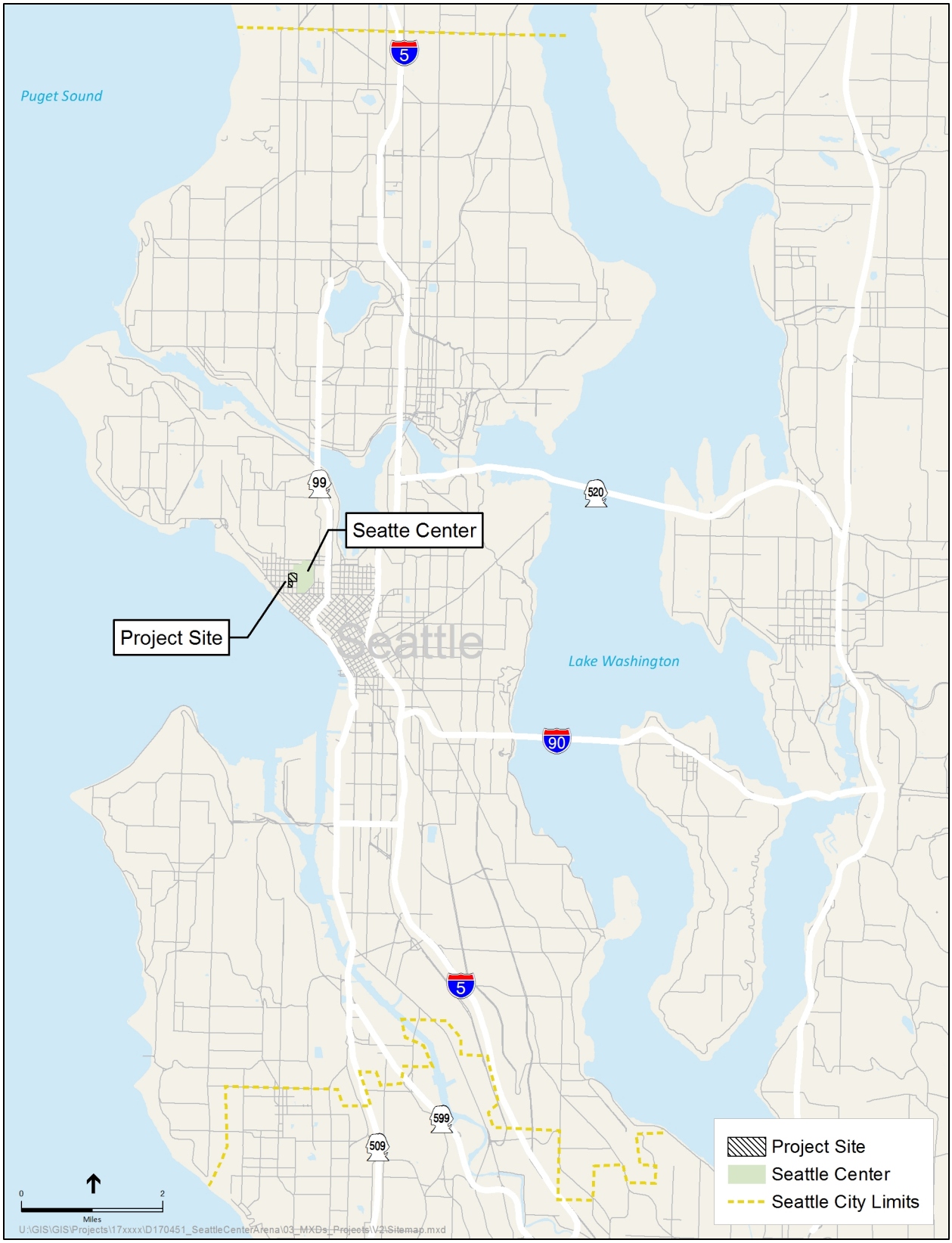


Figure 1-1. Vicinity Map of the Seattle Center

The MOU provides that final terms would be contained in various transaction documents including a Development Agreement, a Lease Agreement, and a Seattle Center Integration Agreement, all of which would be informed by the preparation of this EIS. The Development Agreement would contain construction terms, the Lease Agreement would define the property lease, and the Integration Agreement would address the longer term operational agreements between Seattle Center and OVG or its affiliate. These agreements will be finalized after preparation of the Draft and Final EIS documents.

On August 2, 2017, the City's Landmarks Preservation Board voted to designate KeyArena/the Washington State Coliseum and Bressi Garage as Seattle Landmarks. In coordination with the City, OVG nominated KeyArena/the Washington State Coliseum for listing in the Washington Heritage Register. On March 8, 2018, the property was listed on the Washington Heritage Register and recommended eligible for listing in the National Register of Historic Places by the Washington State Advisory Council on Historic Preservation. This recommendation has been submitted to the National Park Service for approval. In soliciting proposals for the renovation of KeyArena, the City expressed a preference for preserving the iconic exterior of the KeyArena.

1.3 PROJECT OBJECTIVE

The objective of the project is to renovate KeyArena at Seattle Center into a modern multi-purpose arena to accommodate music, entertainment, and sports events, including meeting NBA, NHL, and WNBA league standards, as well as continuing current uses.

1.4 SEPA SCOPING PROCESS AND PUBLIC COMMENT

A Notice of Application, Issuance of Determination of Significance, and Request for Comments on the Scope of the EIS for the Seattle Center Arena Renovation Project was initially issued by SDCI on September 7, 2017 (City of Seattle, 2017c). The Notice was reissued on September 14 and 18, to reflect a change in the date of the public scoping meeting. All comments received were considered in the development of the scope of the Draft EIS.

Scoping comments include oral testimonies and written comment forms received at the scoping public meeting, as well as emails and mailed comment letters sent to SDCI. Approximately 24 members of the public attended the public meeting held on September 28, 2017, at Seattle Center. An oral testimony period offered the public an opportunity to provide input about the alternatives being considered, areas of the environment to be included in the EIS, likely impacts, potential mitigation, and other concerns about the process.

A total of 41 comment letters and oral testimonies were received during the scoping period. These letters included a total of 182 individual comments. Public comments were used to inform the alternatives and elements of the environment to be included in this Draft EIS. At the conclusion of scoping, SDCI determined the issues and alternatives to be analyzed in this Draft EIS. Ten broad areas of environmental review are evaluated, including:

- Land Use (Uses, Plans and Policies, Zoning, Neighborhood Character)
- Transportation, including Parking

- Earth (Geology and Soils)
- Historic and Cultural Resources
- Recreation
- Noise and Vibration
- Visual Resources (including Public Views, Light and Glare)
- Air Quality and Greenhouse Gas (GHG) Emissions
- Public Services and Utilities
- Plants (Trees)

As provided by SEPA (Washington Administrative Code [WAC] 197-11-440(6)(a)), elements of the environment that are not significantly affected do not need to be included in an EIS. After considering the scoping comments and SEPA requirements to inform the appropriate scope of analysis for the proposed project, the Lead Agency determined that the following elements of the environment would not be significantly affected by the project and are not analyzed in this Draft EIS: Water, Energy and Natural Resources, Animals, and Environmental Health (except for the Noise component).

Transportation impacts were the most frequently cited concern during scoping. Other scoping comments identified concerns about potential impacts from construction and operation to nearby businesses associated with increased traffic congestion, parking, and noise impacts. Some commenters stated that the South of Downtown (SoDo) area was preferable for an arena because they believe that area does not have the same congestion concerns, and some commenters asked that an off-site location be considered as an alternative. Because the objective of the project is the renovation of KeyArena, an off-site location is not evaluated in the Draft EIS. Based on the scoping comments received, no other social or economic issues are evaluated in this EIS. More details on comments received (including the full text of the scoping comments during the scoping process) can be found in Scoping Comment Summary, Seattle Center Arena (City of Seattle, 2017b) available at: http://web6.seattle.gov/dpd/edms; project number: 3029061.

1.5 DRAFT EIS SEPA REVIEW PROCESS

This Draft EIS was prepared pursuant to the state SEPA rules (WAC 197-11), Seattle Municipal Code (SMC) 25.05, and Revised Code of Washington [RCW] 43.21c. This project-level Draft EIS describes potential adverse environmental impacts of each alternative and describes potential mitigation measures to reduce adverse impacts. The SEPA process is designed to inform decision-makers and the public regarding reasonable alternatives, potential adverse environmental impacts, and reasonable mitigation measures associated with a proposal. This EIS document is not an authorization for an action, nor does it constitute a decision or a recommendation for an action.

The following actions for the proposed renovation of KeyArena are encompassed by this EIS:

- Permitting for renovation of the arena infrastructure, buildings, and other related improvements, and associated permits for all other land-altering, building, and construction for the proposed project, potentially including: Master Use Permit (MUP), Demolition Permits, Building/Grading/Shoring Permits, Mechanical Permit and Electrical Permits, Tree and

Vegetation Removal Permit, Significant Structure Term Permit, Street Improvement Permits, Street Use Permits, and Utility Relocation and Development Permits.

- Preparation of a Lease Agreement, Development Agreement, and Seattle Center Integration Agreement.
- Possible night-time construction work variance pursuant to the Seattle Noise Control Code (SMC 25.08).
- Possible variances or exceptions from the Land Use Code for curb cuts (SMC 23.54), signage (SMC 23.55), or other development standards.
- Possible Land Use Code amendments.
- Certificates of Approval from the Landmarks Preservation Board.

Following issuance of the Draft EIS, there will be a 45-day comment period when comments on the document can be submitted to SDCI. The public is encouraged to comment on the Draft EIS; the Final EIS will respond to comments received on the Draft EIS.

1.6 ALTERNATIVES EVALUATED IN THE DRAFT EIS

Three alternatives are analyzed in this Draft EIS:

- No Action Alternative
- Alternative 1: Oak View Group (OVG) Proposal
- Alternative 2: Modified Proposal

See Chapter 2 for detailed descriptions of each of these alternatives.

1.7 SUMMARY OF IMPACTS, POTENTIAL MITIGATION MEASURES, AND KEY FINDINGS

Table 1-1 summarizes the potential construction impacts from the alternatives evaluated in this Draft EIS, as well as potential mitigation measures to reduce or eliminate construction impacts. Potential impacts and measures to reduce construction impacts are described in more detail in Chapters 3 through 12.

Table 1-2 summarizes the potential operations impacts from the alternatives evaluated in this Draft EIS, as well as potential measures to reduce or eliminate impacts. Potential operations impacts and measures to reduce impacts are described in more detail in Chapters 3 through 12.

Table 1-1. Summary of Potential Construction Impacts and Measures to Reduce Impacts

	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Land Use		
Impacts	• Demolition of existing structures, skatepark, and surface parking in the project site. • Temporary displacement of some existing uses from the project site. • Temporary street closures. • Variance requests for curb cuts, signage, and night-time construction work. • Indirect impacts during construction to nearby businesses/ properties due to construction-related loss of parking, noise, and congestion. • Intermittent inconveniences to residents and businesses could contribute to some residents or businesses deciding to relocate.	Same as Alternative 1, except fewer variance requests.
Measures to reduce or eliminate impacts	• Advance notice to existing tenants of the construction period. • Coordination with displaced tenants. Assistance in identifying alternative locations to hold games, concerts, and other events. Assistance in working with Seattle Center event schedulers to determine whether the displaced tenants could return to the arena once construction is completed. • Assistance in publicizing the relocation of programming to the potential attendees. • Close coordination with residents and businesses in the area to provide advance notice of construction schedules and potential detour routes. • Robust marketing plan to ensure that the public knows Seattle Center and its resident organizations are open for business during construction. • Provide an OVG Community Liaison as described in the Arena at Seattle Center MOU (City of Seattle and OVG, 2017). • Follow design guidelines prescribed by the City and follow the City procedures for variances.	Same as Alternative 1.
Transportation		
Impacts	• Closure of streets, bicycle facilities, and parking/loading areas, and reduced bus/truck staging, sidewalks, bus stops, and bus layover space during construction would cause the greatest impacts. Degraded traffic operations and pavement deterioration related to truck hauling are also potential impacts.	Same as Alternative 1, except duration of intense construction-related impacts would increase by at least 6 months.

	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Measures to reduce or eliminate impacts	• Street use permits and other agreements to provide temporary locations for the following displaced facilities/uses: Metro bus layover and bus stop; bicycle facilities; pedestrian access; parking; and curb space event loading/unloading. • Construction Management Plan (CMP) addressing: truck haul routes, hours, and allowed volumes; staging areas; employee parking, shifts, and transportation demand management (TDM) measures; street closure procedures; coordination with large events; and point of contact for neighbors.	Same as Alternative 1.
Earth		
Impacts	• Erosion, vibration, slope stability, and other construction-related impacts associated with excavation and other earthwork. • Some dewatering likely, which may change groundwater patterns.	Same as Alternative 1.
Measures to reduce or eliminate impacts	• Construct project in accordance with best management practices (BMPs) and applicable permit, safety, and building requirements. • Adhere to excavation safety standards. • Conduct geotechnical hazard evaluations (by licensed geotechnical engineer) and incorporate recommendations into project design. • Monitor vibration at Northwest Rooms, Bressi Garage, and other sensitive structures within 100 feet of earthwork. • Conduct dewatering in accordance with permit requirements.	Same as Alternative 1.
Historic and Cultural Resources		
Impacts	• Significant impacts to 4 designated Landmarks: KeyArena, Bressi Garage, Northwest Rooms and International Fountain Pavilion, and the International Plaza are expected. • Designated Landmark features of the arena could be impacted by the atrium lobby, new sign on top of the arena, larger cupola, and removal of the south curtain wall. Impacts to Landmark-designated features would be significant. • The KeyArena site would be impacted by the alterations to the surrounding plazas; impacts would be significant. • Designated features of Bressi Garage would be impacted by possible disassembly and reassembly of the building, or vibration from tunneling beneath the building. These impacts would be significant. • Designated features of the Northwest Rooms and International Plaza may be	• Impacts from removal of the south curtain wall, a larger cupola, and the new atrium lobby are the same as Alternative 1. The sign would be the same as existing conditions. • Impacts to Bressi Garage are less than from Alternative 1 because tunneling would be adjacent to the building, and therefore it would not be disassembled. However, tunneling next to the building could still cause significant impacts to the exterior of Bressi Garage through vibration. • Impacts to designated features of the

	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
	impacted by vibration. The exteriors of the Northwest Rooms and International Plaza would be impacted by possible modification of the breezeway and construction of an overlook and ADA ramp. Excavation and shoring could result in vibration impacts. These impacts would be significant. • There is a potential to impact the depositional integrity of belowground cultural resources, if present, although the likelihood is low for the arena site, Northwest Rooms, and International Plaza. • The portion of the project site at and surrounding Bressi Garage could contain belowground cultural resources (e.g., the remains of former building foundations, refuse, or privies) that could be disturbed during construction.	Northwest Rooms and International Plaza would be the same as Alternative 1. • Potential impacts to belowground cultural resources are the same as Alternative 1, except that construction of the loading-dock access tunnel in Alternative 2 could impact different belowground cultural resources than described for Alternative 1.
Measures to reduce or eliminate impacts	• Consistency with Seattle Historic Preservation Program's Certificate of Approval process. • Stabilize buildings as needed. • Reassemble Bressi Garage and/or restore exterior as needed. • Prepare and implement an Inadvertent Discovery Plan for the project.	Same as Alternative 1, except Bressi Garage would not be disassembled.
Recreation		
Impacts	• KeyArena would be closed to recreational events during the construction period, requiring events to be held elsewhere. • Visitors to recreational programming (such as concerts, film screenings, and classes) at tenants in the Northwest Rooms and Bressi Garage could be impacted by visible and audible construction, relocations, or unavailable programming. • The DuPen Fountain would be closed to visitors during the construction period. • Visitors to the International Fountain and Lawn, and South Fountain Lawn could be impacted by visible and audible construction activities.	Same as Alternative 1, except the duration of construction-related impacts to recreation would be longer.
Measures to reduce or eliminate impacts	• The Seattle Center Development Agreement would outline measures to minimize impacts to Seattle Center visitors during construction. • To avoid conflicts with scheduled events, Seattle Center is no longer scheduling events at the arena during the planned construction period, and is working to reschedule events already planned during that period.	Same as Alternative 1.

	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Noise and Vibration		
Impacts	• Day-time stationary construction activities would temporarily increase ambient noise levels. Construction activities may not comply with code standards if pile driving is used. • Pile driving, excavation activities, and other construction noise may impact the day-time operations of KEXP, and to a lesser extent SIFF Film Center and Vera Project. • Night-time construction, including truck queuing and loading, would not comply with code limits and would impact residential and other sensitive receptors. • There would be additional noise from truck pass-by events during construction, especially during the first 6-months. This would be a less-than-noticeable increase of ambient noise levels during daytime hours and an increase of 1.3 dBA, which is barely perceptible, during night-time. • If pile driving or augering is used, vibrations could result in building damage to sensitive structures. • Vibration-inducing construction equipment could impact operations of KEXP and other Northwest Rooms tenants.	Similar to Alternative 1, except night-time construction would be consistent with code limits. Noise impacts would be less intensive during the evening hours, but the overall duration of construction-related noise would be at least 6 months longer.
Measures to reduce or eliminate impacts	• Develop a Noise Management and Mitigation Plan. • Stationary noise sources should be located as far as possible from adjacent receptors and muffled to the greatest degree feasible and/or enclosed. • Notify building owners and occupants prior to pile-driving or other disruptive construction activities. • Project based diesel engines should be required to use silencers during night-time hours. • Project site-based backup warning devices should be the broadband type or an alternative that is allowed by WAC 96-155-610(2)(e). • Should not allow trucks to use compression brakes, except for safety reasons. • Evaluate the need for the short-term relocation of tenants or some of their activities and residents within close proximity of operation of impact equipment, excavation, and truck loading during the night-time construction period. • Coordinate with KEXP and other tenants to identify which areas of operation are most directly impacted and develop specific mitigation. • Implement “quiet” pile techniques.	Same as Alternative 1.

	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Visual Resources		
Impacts	• Construction staging and material storage, detours and associated signage, scaffolding and fences, temporary vegetation clearing, and the increased presence of construction vehicles, equipment, materials, and personnel would result in temporary construction impacts to visual quality. • Construction equipment would obscure views of the designated Landmarks during construction. Scenic views of KeyArena, Bressi Garage, and the Northwest Rooms could be impacted during construction. • Increased light and glare from night-time construction lighting could affect residents of Astro Apartments and residents of the Sacred Heart shelter, visitors to Fisher Pavilion, and drivers and pedestrians on 1st Ave N and Thomas St.	• Same as Alternative 1, except that the need for night work lighting would be reduced. • Views of Landmark-designated structures would be obscured for longer because of the extended construction schedule.
Measures to reduce or eliminate impacts	• Restore staging areas following project completion. • Replant vegetation. • Reduce timeframe that construction activities would obscure public views. • Implement a construction lighting plan to limit light and glare impacts from evening and night work. • Shield or direct construction lighting to restrict light spillage. • Limit night-time construction.	Same as Alternative 1.
Air Quality and GHG Emissions		
Impacts	• Construction activities would generate dust, air emissions, and GHGs. • Construction-related emissions of criteria air pollutants would be below applicable thresholds in King County of 100 tons per year of carbon monoxide or fine particulate matter (PM10).	The total emissions would be the same as described Alternative 1.
Measures to reduce or eliminate impacts	• Control fugitive dust from construction activities. • Cover haul trucks transporting soil, sand, or other loose material off-site. • Remove visible mud or dirt track-out onto adjacent public roads.	Same as Alternative 1.

	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Public Services and Utilities		
Impacts	• Emergency response time to Seattle Center may increase slightly due to increased congestion on roads affected by construction. • Nearby residents, Seattle Center tenants, as well as the Center School and the Downtown School may experience sporadic and temporary disruptions during construction. • Short-term disruptions to all utilities and garbage/recycling pick-up could occur.	Same as Alternative 1.
Measures to reduce or eliminate impacts	• Conduct construction in compliance with the City Fire Code. • Coordinate with utility providers to reduce utility outages to area businesses and residences. • Provide advance notice of any planned temporary service outages.	Same as Alternative 1.
Plants		
Impacts	• Construction activities near exceptional, legacy, or street trees could damage tree roots or canopy. • Removal of up to 9 exceptional, legacy, and/or street trees. • Removal of existing landscaping including approximately 60 non-exceptional or legacy trees.	• Same as Alternative 1, except fewer trees would be removed (up to 5 exceptional, legacy, and/or street trees).
Measures to reduce or eliminate impacts	• Develop a Tree, Vegetation, and Soil Protection Plan. • Follow protection measures outlined in Director's Rule 30-15 and the Street Tree Manual (SDOT, 2014). • Compliance with City's Tree Protection Ordinance would reduce impacts to trees. • Comply with Executive Order 03-05 to replace trees at least a 2:1 ratio.	Same as Alternative 1.

Table 1-2. Summary of Potential Operations Impacts and Mitigation Measures to Reduce Impacts

	No Action	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Land Use			
Impacts	• No direct land use impacts.	• Permanent displacement and demolition of some buildings on the project site. • The potential more than doubling of the number of days during the year with highly attended events at the renovated arena would be noticeable in neighboring areas and may be a quality of life consideration for some residents; associated congestion could affect businesses and institutions.	Same as Alternative 1, except a woonerf on Thomas St would be closed to car and truck traffic during events.
Measures to reduce or eliminate impacts	None	• Provide relocation and financial assistance for permanent displacements from the project site. • Provide an OVG Community Liaison as described in the Arena at Seattle Center MOU. • Coordinate with local bars, restaurants, and other businesses to incorporate traffic congestion solutions in the Transportation Management Program (TMP).	Same as Alternative 1, except that advanced notice would be provided to indicate when the woonerf would be closed.
Transportation			
Impacts	• The proportion of intersections operating at LOS E or F is projected to increase from 19% under existing conditions to 59% under 2020 No Action conditions with average Seattle Center attendance. • During the weekday evening peak period, over-capacity conditions in the eastbound directions of Mercer St and Denny Way would	• Potentially significant impacts to intersection operations would occur during both pre-event and post-event peak hours. • The I-5 off-ramp vehicle queue would spill back onto the I-5 mainline at the Mercer St exit. • Buses would experience travel time and reliability degradation due to increased intersection delay. Crowding impacts would occur on bus routes to U District and Ballard, and on LINK light rail. Ridehailing vehicles dropping off before events could temporarily block transit access. • Significant pedestrian impacts are expected at the 5th Ave N/Harrison St crosswalk due to high demand. • Ridehailing vehicles could temporarily block bicycle facilities before events, resulting in safety impacts.	• Intersection LOS and I-5 off-ramp queue spillback similar to Alternative 1, although modestly better adjacent to the arena due to reduced off-street parking supply compared to Alternative 1. • Safety impacts to bicyclists and pedestrians associated with ridehailing after events would be better than No Action because ridehailing would be more dispersed. • Decreased off-street parking supply immediately south of

	No Action	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
	result in longer queues and reduced travel speeds as compared to current conditions. • Bus travel time and reliability are expected to degrade as congestion increases. • On-street parking is expected to remain similar to existing conditions.	• Motorists circling for parking before events could increase conflicts with pedestrians, bicyclists, and other vehicles.	the arena during events would increase competition for parking elsewhere, increasing modal conflicts.
Measures to reduce or eliminate impacts	None	• Develop and implement an Event TMP identifying street/lane closures, placement of traffic control officers, signal timings, curb space management, and temporary signage and equipment. Event TMP could include attendance thresholds to trigger plan elements, performance metrics, and monitoring program. • Develop and implement Event Demand Management Plan (DMP) to reduce private auto and ridehailing trips. • Implement traffic signal improvements. • Develop a ridehailing pick-up/drop-off plan to reduce conflicts. • Install bicycle parking and bicycle facility improvements. • Provide pedestrian crossing improvements. • Implement additional bus, light rail, and/or Monorail service. • Implement bus stop improvements. • Develop and implement off-site Parking Facility Reservation and Best Practices System, real-time parking garage information, on-street parking management revisions, and shuttle program to remote lots. • Implement transit speed and reliability improvements.	Similar to Alternative 1. TMP strategies would be adjusted to reflect different parking and ridehailing locations.

	No Action	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Earth			
Impacts	None	• Erosion potential. • Potential to change groundwater patterns and affect the structural stability of buildings.	Same as Alternative 1.
Measures to reduce or eliminate impacts	None	• Develop monitoring and maintenance program that includes inspection and reporting on structural stability.	Same as Alternative 1.
Historic and Cultural Resources			
Impacts	None	None	None
Measures to reduce or eliminate impacts	None	None	None
Recreation			
Impacts	KeyArena would continue to be an undersized facility not suitable for NHL or NBA teams.	• Seattle Center Pavilion would be demolished and not replaced, causing loss of event space. • The skatepark would be demolished and replaced off-site. Temporary loss of skatepark would occur.	Same as Alternative 1.
Measures to reduce or eliminate impacts	None	• Replace the skatepark at an off-site location.	Same as Alternative 1.

	No Action	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Noise and Vibration			
Impacts	None	• Exterior noise levels would not increase more than 5 dBA Leq over existing arena events, which already exceed standards. • There would be an increase in the frequency of noise-generating events. • There may be an increase in outdoor noise levels for special events such as playoffs.	Same as Alternative 1.
Measures to reduce or eliminate impacts	None	• Comply with SMC noise regulations. • Deploy temporary noise mitigation measures during nosiest concerts.	Same as Alternative 1.
Visual Resources			
Impacts	None	• The atrium lobby would be a departure from existing visual character as it would be a more modern structure. • Atrium lobby glass has the potential for glare impacts. • The proposed accent lighting along the roof would make the roofline more prominent at night. • Landmark features would be removed (e.g., the curtain wall on the south wall of the arena) and substantially altered (e.g., the International Plaza). • The cupola and sign on top of the building would be larger, increasing the profile of the arena. • Signs would be larger and more numerous than at present or currently allowed under the Sign Code (SMC 23.55), and could add visual clutter to the site. • Night-time lighting would increase due to larger, brighter, and more numerous signs, including a larger and brighter digital sign on 1st Ave N and larger and brighter roof signs. • Glare from the digital reader board next to 1st Ave N, and the length of video messages on that sign could distract drivers and pedestrians and pose a safety risk.	Similar to Alternative 1, except Alternative 2 would have signage similar to existing conditions, resulting in fewer visual impacts.

	No Action	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
		• Public artwork on the project site would be removed in accordance with the City's Deaccessioning Ordinance. • Potential inconsistency with the Uptown Design Guidelines and Century 21 Guidelines resulting from proposed signage.	
Measures to reduce or eliminate impacts	None	• 1st Ave N sign, digital display sign could comply with the Sign Code. • Use a static image on the 1st Ave N sign and place restrictions on the length and type of video display allowed for the other proposed signage. • Light levels emitted from signs could be adjusted to respond to ambient conditions, and thereby avoid excessive brightness. The transition from day to night-time brightness could occur gradually, to prevent a sudden change in perceptible brightness levels by pedestrians and motorists. • An operational lighting plan that complies with City Code should be developed. • Digital displays could be restricted from having large areas of reflective elements. • New fixtures and light sources could focus light on-site. • Fixtures could be LED and shielded. • Trees canopy could be increased to reduce glare from the south- and west-facing façades of the atrium lobby. • Cladding material and geometry for all new structures could be designed to reduce glare impacts.	Same as Alternative 1, except that compliance with Sign Code would limit luminance of digital displays and other proposed non-confirming signage, resulting in fewer mitigation requirements.
Air Quality and GHG Emissions			
Impacts	None	• Operational activities would generate air emissions and GHGs. • Operational emissions of criteria air pollutants would be below federal thresholds for CO and PM10 in 2020 and would decline further by 2035. • Operational GHG emissions would initially reach approximately 28,200 metric tons/year, of which vehicle emissions constitute 99%. • Emissions would decline annually to approximately 23,800 metric tons/year by 2035.	Same as Alternative 1.

	No Action	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Measures to reduce or eliminate impacts	None	• Mitigation is not necessary for criteria air pollutants. • Measures to reduce total volume of vehicles arriving to events would help reduce GHG emissions from mobile sources. • Mitigation is not required for GHG from non-mobile sources.	Same as Alternative 1.
Public Services and Utilities			
Impacts	None	• Additional Seattle Police Department officers may need to work during major arena events to assist with traffic flow and parking enforcement. • Increased demand for water and wastewater service due to increased attendance and frequency of events, as well as increased garbage and recycling volume generation.	Same as Alternative 1.
Measures to reduce or eliminate impacts	None	• Integration Agreement would include coordination of public services and utilities during arena operation. • Install low-flow plumbing fixtures to reduce water and wastewater demand. • Incorporate water-efficient and bio-retention landscaping, and rainwater harvesting/irrigation reuse. • Include energy-efficient fixtures to reduce utility demand.	Same as Alternative 1.
Plants			
Impacts	None	• Temporal loss of tree canopy from the removal of mature trees and replacement with younger, smaller trees.	Same as Alternative 1.
Measures to reduce or eliminate impacts	None	• Design landscaping to be consistent with the Seattle Center Landscape Management Plan.	Same as Alternative 1.

1.8 CUMULATIVE IMPACTS

Cumulative impacts result from the incremental consequences of a project when added to reasonably foreseeable future actions. The cumulative effects may be undetectable when viewed individually, but when added to impacts from other projects may cause measurable environmental impacts. The Uptown area has experienced substantial redevelopment in the past several years, and this trend is anticipated to continue. Construction activities from the project would contribute to construction impacts that may occur from other projects. The completion of the Seattle Center Arena would contribute to increased traffic congestion, adding to traffic accompanying other development projects. The project would contribute to increased lighting levels and overall noise in the area, adding to increased lighting levels and noise associated with other development projects. For additional information and analysis of cumulative impacts, see Chapter 13.

1.9 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

Significant unavoidable adverse impacts are those for which mitigation measures would be unable to reduce impacts to a level of non-significance.

During construction under Alternatives 1 and 2, alterations to Landmark-designated features of KeyArena, the Northwest Rooms, International Plaza, and Bressi Garage would result in significant unavoidable adverse impacts.

During operation under Alternatives 1 and 2, potentially significant unavoidable impacts to traffic operations, transit, and parking are expected to occur, resulting from increased traffic volumes associated with events at the renovated arena.

1.10 BENEFITS AND DISADVANTAGES OF DELAYING THE PROPOSAL

The EIS must discuss the benefits and disadvantages of delaying implementation of the proposal (WAC 197-11-440(5)(c)).

If the City of Seattle chooses to delay renovation of the arena and associated improvements, potential benefits would include the following:

- Delaying construction impacts and perhaps avoiding conflicts with other construction projects, including residential and multi-use development projects occurring in Uptown.
- Providing more certainty regarding future traffic conditions associated with implementation of planned/proposed improvements to public transportation and transit (e.g., additional Metro routes, Sound Transit LINK light rail to near the arena, potential Monorail service expansion, and other improvements).

The disadvantages of delaying the arena renovation project include the following:

- There would be a delay in meeting the City's objective to renovate and revitalize KeyArena.
- The site may remain in its existing condition and require maintenance to avoid deterioration. The site would retain the existing structures and uses, unless or until some other renovation is proposed and approved. The City would incur the cost of delayed major maintenance required to keep KeyArena in use as a sports and entertainment venue. Public money would be needed to fix operational, structural, and maintenance issues that arise from retaining KeyArena in its existing condition.
- Due to its small size, bowl configuration, and other limitations, the site would have less capacity to provide recreational sport viewing opportunities compared to peer venues, and would not be a viable location for NBA or NHL teams (AECOM, 2015), with the resulting loss of jobs and economic stimulus that major sports franchises could provide.
- A delay could result in the loss of private funding by OVG to renovate KeyArena.
- Construction costs could increase, and there may be a need for new environmental, economic, and design studies, depending on the length of delay and changes in other conditions.

1.11 SIGNIFICANT AREAS OF CONTROVERSY AND UNCERTAINTY

Controversy around the Seattle Center Arena Renovation Project has focused largely on the potential for significant traffic and parking impacts in an already congested area, particularly the Mercer St and Denny Way corridors. These issues have been raised prior to and during EIS scoping, and during neighborhood meetings, and have resulted in a comprehensive, detailed evaluation of transportation impacts in the Draft EIS.

Areas of uncertainty relate to the timing and effectiveness of proposed transportation system improvements such as Sound Transit LINK light rail, opening of the State Route (SR) 99 tunnel, and reconnection or "re-knitting" of streets across SR 99, which are anticipated to alleviate traffic congestion. Delay in construction of these regional transportation system improvements could delay the anticipated congestion relief associated with these projects.

1.12 ISSUES TO BE RESOLVED

The location of the relocated skatepark has not been determined at the time of Draft EIS publication. The City is working with the skatepark community to relocate the skatepark.

Potential design changes to the Landmark-designated KeyArena, Northwest Rooms, and International Plaza could occur. The construction method for tunneling has not been determined. If an open-cut method is selected to construct the loading-dock tunnel, this would require disassembly, cataloging and storage of building components, and reassembly of Bressi Garage after construction is complete. If a tunnel boring machine or auger is used, Bressi Garage would remain in place but require stabilization.

The City is conducting a feasibility study for potential station reconfiguration options to increase capacity of the Monorail, and in turn increase its potential to carry a higher proportion of arena event attendees. The study will be completed in time to be considered for the Final EIS.

2.0 DESCRIPTION OF ALTERNATIVES

This chapter provides an overview of the Seattle Center Arena Renovation Project and the alternatives being considered in the Draft EIS. The alternatives described include the No Action Alternative, Alternative 1 (the OVG Proposal), and Alternative 2 (Modified Proposal).

The proposed project is the renovation of the arena at Seattle Center and associated improvements to create a modern multi-purpose entertainment and sports center that would host concerts, sporting events, family shows, community-oriented events, and numerous other events, and that would meet NHL and NBA league standards. The project would accommodate many current uses including the Seattle Storm WNBA franchise. The project would include redesigned, reconstructed, and expanded interiors within the arena's existing building envelope to enhance the experience for sports and entertainment events. The renovation would support Seattle Center's mission to serve as a regional destination. Seating capacities would range from approximately 17,500 for hockey games to approximately 18,350 for basketball games, and up to approximately 19,125 for concert configurations. The outer structural elements of the existing arena would be maintained, including the Landmark-designated roof structure and the support structures (pylons). Other renovations include a new atrium lobby and expanded parking capacity.

The project site is on City-owned property within the Seattle Center campus and includes the existing KeyArena, surrounding plazas, and associated buildings; as well as the south parcel, which includes Bressi Garage, 1st Ave N Garage, and adjacent surface parking lot. Thomas St between KeyArena and the south parcel is not part of the area to be leased, but an access tunnel is proposed below the surface of Thomas St to provide access to the underground loading dock.

2.1 NO ACTION ALTERNATIVE

Analysis of the No Action Alternative is required under SEPA and serves as the baseline condition against which the action alternatives are compared. On the project site, KeyArena would not be renovated, the buildings on the site would remain (with the exception of possible renovations associated with planned maintenance), and no new buildings would be constructed except as directed by existing or proposed Seattle Center planning efforts. Factors that affect the arena's utility (its small size, limited concourse, and limited backstage, rigging, and loading facilities) would remain (AECOM, 2015). In addition, there would be no change to parking or loading (Figure 2-1). Maintenance and ongoing activities and operations at KeyArena would continue as guided by the Seattle Center Master Plan (Seattle Center, 2008).

The No Action Alternative represents the future in the absence of the proposed project; it is not the same as existing conditions because a number of projects not associated with the arena are expected to be completed by 2020 (or "Opening Day" as defined for Alternatives 1 and 2). The No Action Alternative was developed based on reasonably foreseeable projects that would be in place by 2020, the majority of which are transportation projects (such as the opening of the SR 99 tunnel, and reconnection of streets across SR 99). The Seattle Opera at Seattle Center on the former Mercer Arena site will be completed in 2018, and other developments such as a new residential building west of the Mercer St Garage are expected to be completed by 2020. Projects considered as part of background conditions for 2020 are listed in Appendix A. See Section 2.4, *Comparison of Alternatives*, for a side-by-side comparison of the No Action Alternative and Alternatives 1 and 2.

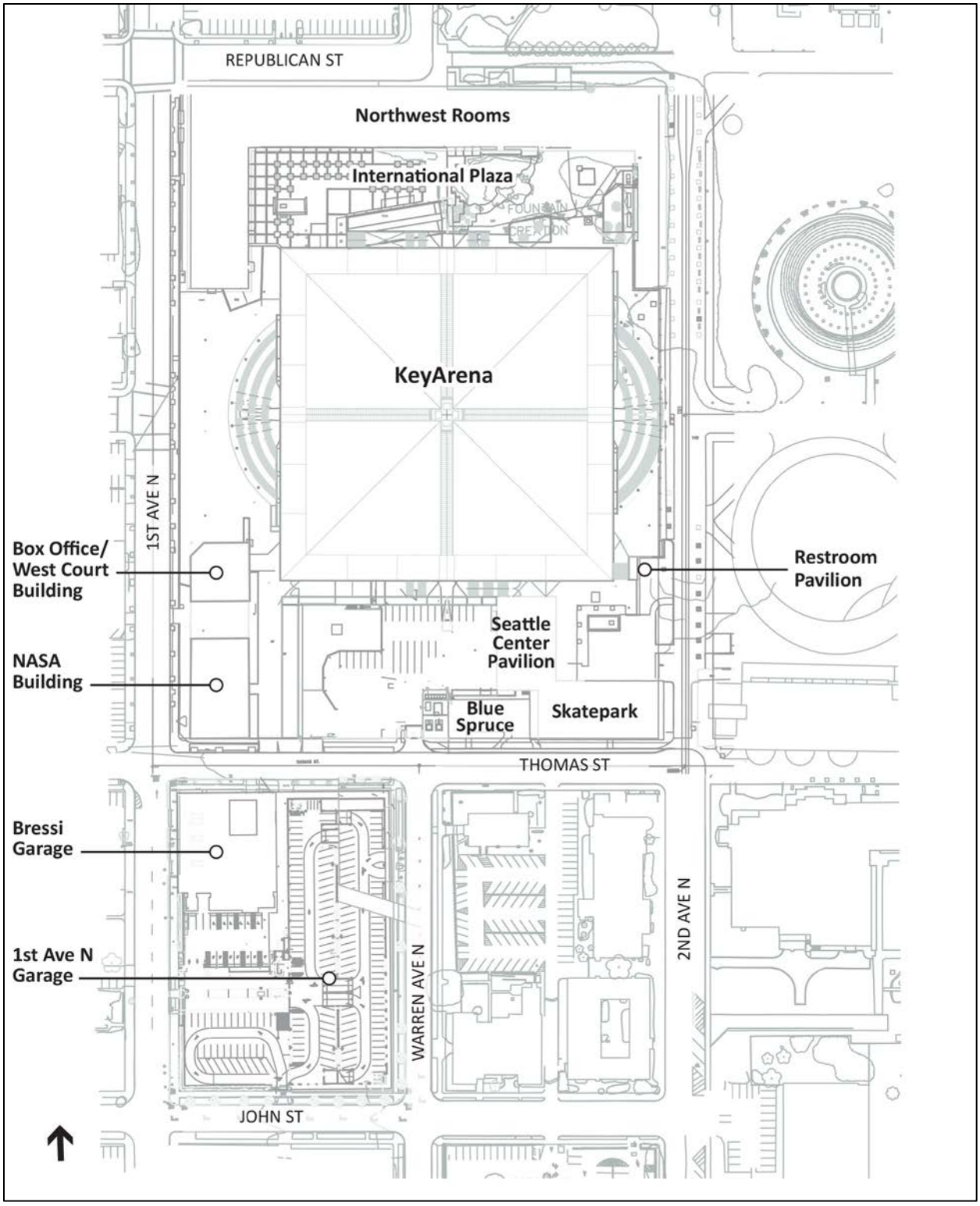


Figure 2-1. No Action Alternative

2.2 ALTERNATIVE 1: OAK VIEW GROUP (OVG) PROPOSAL

Alternative 1 is the renovation of KeyArena to meet NHL and NBA league standards for a professional hockey and basketball arena, while maintaining the building's Landmark-designated design. See Section 2.4, *Comparison of Alternatives*, for a side-by-side comparison. Alternative 1 includes the following infrastructure, buildings, and other related improvements (Figure 2-2):

- Landmark-designated arena features would be preserved or restored as required by the City, including the roof and edge beam structure and pylons, and the north, west, and east curtain walls (Figure 2-3). The glass in these curtain walls would be replaced with glazing that is the same color, transparency, and reflectivity as the existing curtain wall glass.
- The south façade of the arena, including the curtain wall, would be removed and not replaced.
- The arena would be expanded below-grade to make the interior of the arena wider and deeper (see Figures 2-2 and 2-4).
- The cupola—the structure on top of the existing arena—would be more than 50% larger than the existing cupola, but not taller, to accommodate additional exhaust fans.
- An atrium lobby would be added to the south of the arena, which would be the primary location for entrance to the arena. The atrium lobby would be primarily glass, would protect the integrity of the historic roof line, and would not extend beyond the outside edges of the arena (Figure 2-5). A large digital display would be displayed on or visible through the atrium lobby.
- Five buildings (West Court Building, NASA Building, Blue Spruce Building, Seattle Center Pavilion, and Restroom Pavilion), the skatepark, a surface parking lot, and the loading/marshalling area to the south of the arena, as well as the plazas to the west and east of the arena, would be demolished.
- A new box office would be constructed in the south plaza as well as 2 small buildings that would contain stairs and mechanical equipment.
- The exterior plaza level would be returned to a condition similar to its original 1962 grade by removing the below-grade entrances and associated stairs. The plazas would be open-space pedestrian plazas with redesigned hardscape and landscape features (Figure 2-5). This redesign would make exterior plazas ADA compliant.
- The Landmark-designated International Plaza, north of KeyArena, would be redesigned to include an ADA ramp and overlook.
- An underground parking garage for approximately 450 vehicles would be built below the south plaza, south of the arena, with a 3-lane driveway entrance from Thomas St (Figure 2-5). A variance from the Land Use Code (SMC 23.54) may be required for the Thomas St driveway entrance curb cut.
- A loading dock with approximately 8 loading bays would be built underground below the south plaza (Figure 2-4). The loading dock would be accessed off of 1st Ave N through an access tunnel under the Landmark-designated Bressi Garage and Thomas St (Figure 2-2).

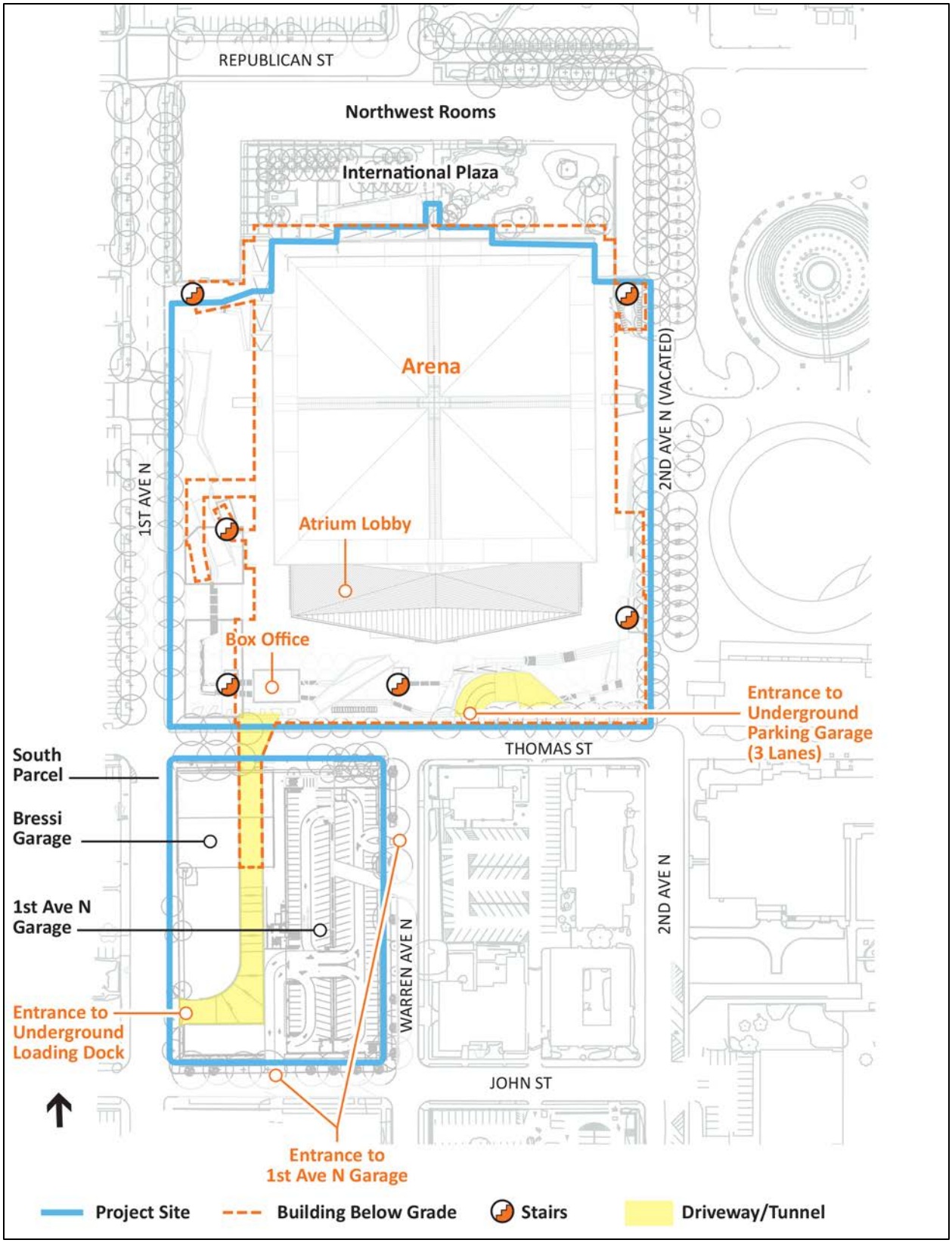


Figure 2-2. Alternative 1: OVG Proposal

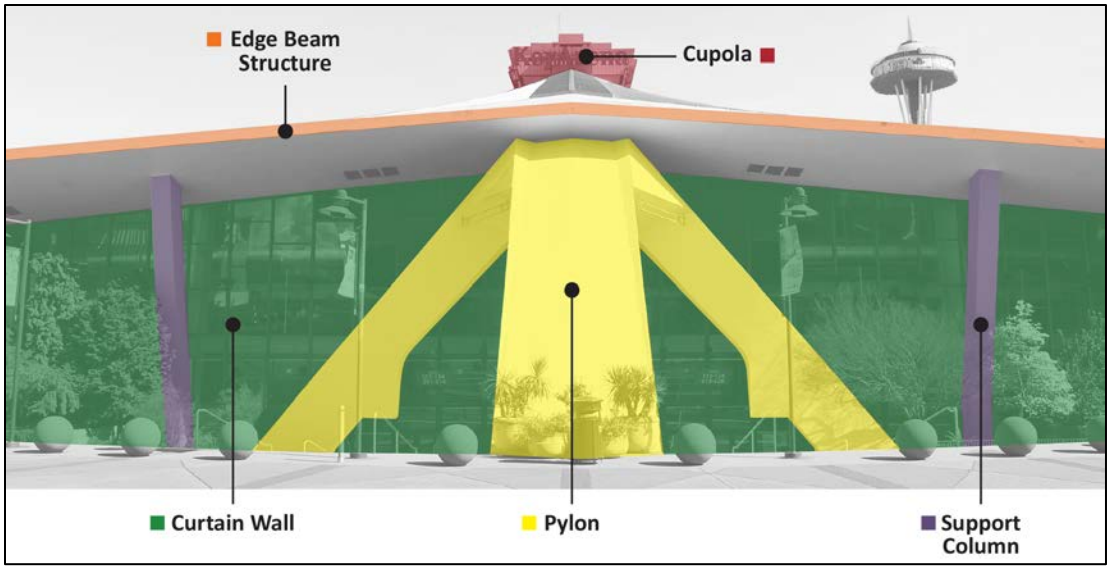


Figure 2-3. Architectural Elements of the Arena

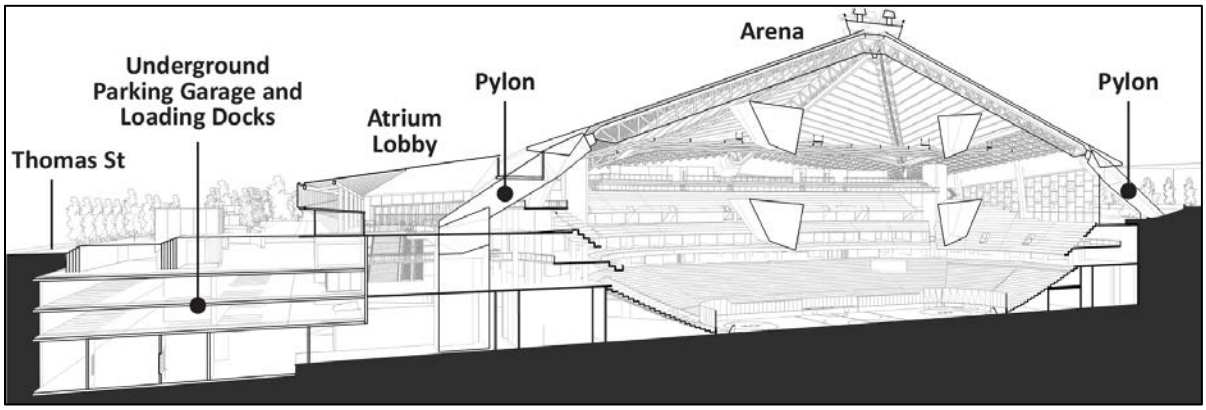


Figure 2-4. Alternative 1: OVG Proposal –Cross Section – Showing Arena and Underground Parking Garage and Loading Dock

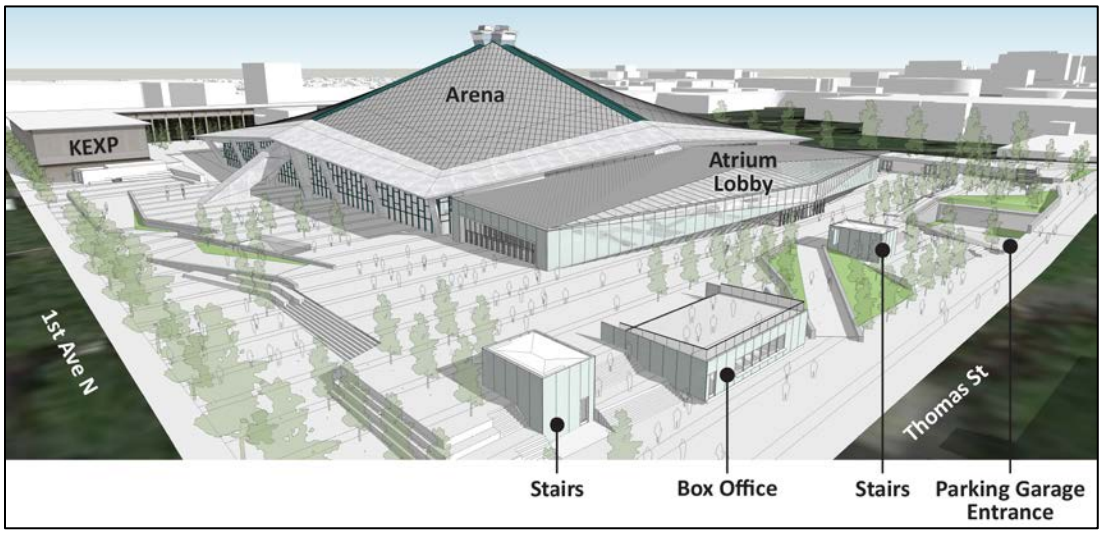


Figure 2-5. Alternative 1: OVG Proposal – Schematic Drawing

- The driveway to the 1st Ave N Garage would be relocated from 1st Ave N to John St, expanding the existing exit on John St to the west to serve as both the driveway entrance and exit. The existing driveway entrance on Warren Ave N would be reopened.
- A variance from the Land Use Code (SMC 23.54) may be required for the relocated curb cuts on 1st Ave N for the driveway to the access tunnel and the relocated driveway entrance to the 1st Ave N Garage on John St.
- Signage surrounding and on the roof of the arena would change, and variances from several Land Use Code standards (SMC 23.55) may be needed for sign quantity, size, brightness, content, and operation. The Exterior Sign Proposal and a list of proposed variances are included in Appendix G. Amendments to the Sign Code may be proposed.
- The existing 4 roof signs (the KeyArena signs) would be replaced with larger (approximately 700 square feet each) and brighter signs.
- The existing digital sign on 1st Ave N (the digital portion is approximately 50 square feet) would be replaced with a digital reader board (approximately 300 square feet) installed facing 1st Ave N with integrated illuminated arena name, as well as video capability.
- Accent lighting would be added on the roof and building façades.
- Additional smaller digital display signs, banners, strings of pennants, and festoons of lights are proposed. Illuminated signs with static messages would be placed above entry doors. Light pole banners, pedestrian direction pylons, digital display signs, and other signs and features, some of which would include advertising, would be placed throughout the project site. See Appendix G for details.
- Transportation network company (TNC) ridehailing service would be unrestricted during drop-off (i.e., pre-event). After a large event at Seattle Center, including an event at the renovated arena, TNCs would be managed by geofencing. Pick-up would be restricted to outside a geofence (an area outside an approximately 1-block radius around Seattle Center) except for 4–5 locations within the geofence.

Construction activities associated with this alternative are described in Section 2.6, *Construction.*

Transportation Network Company (TNC) - TNCs are ridehailing companies such as Uber and Lyft.

Geofence - A geofence is a virtual geographic boundary, defined by global positioning system (GPS) or radio-frequency identification (RFID) technology, that enables software to trigger a response when a mobile device enters or leaves a particular area. In this case, geofencing does not permit users of TNCs to solicit a ride within the geofence.

2.3 ALTERNATIVE 2: MODIFIED PROPOSAL

Alternative 2 would maintain the design of the building's Landmark-designated features as described for Alternative 1, but would reduce potential impacts to Bressi Garage, reduce visual impacts associated with signage, and lessen operations impacts to traffic in the vicinity of the arena, as well as reduce night-time noise impacts (although the construction duration would increase). See Section 2.4, *Comparison of Alternatives*, for a side-by-side comparison. Alternative 2 includes the following differences compared to Alternative 1 (see Figure 2-6):

- The signage for Alternative 2 would be similar to existing conditions. The sign on 1st Ave N and the sign on top of the arena would remain approximately the same size and brightness as the existing signs.
- Underground parking below the south plaza would be reduced (200 spaces provided), and the entrance driveway on Thomas St would be reduced from 3 lanes (as proposed for Alternative 1) to 2 lanes.
- The driveway entrance to the loading dock access tunnel would be from 1st Ave N, but farther north than with Alternative 1. The access tunnel would be under the 1st Ave N Garage, to the east of the Landmark-designated Bressi Garage, rather than under the Landmark-designated building.
- There would be no change to Bressi Garage following construction.
- Thomas St between 1st Ave N and Warren Ave N would be a "woonerf," a street with a raised street-bed where pedestrians and bicyclists have priority over motorists. Before, during, and after events, this section of Thomas St would be closed to vehicles.
- The driveway entrance to the 1st Ave N Garage would be moved to John St, similar to Alternative 1, except that the driveway would be larger and closer to 1st Ave N.
- Parking use in the 1st Ave N Garage would be capped at 400 (approximately 65% of its current capacity).
- TNC drop-off would be unrestricted, the same as for Alternative 1. After any large event at Seattle Center, including an event at the renovated arena, TNCs would be restricted to outside a geofence, and would not include the locations within the geofence that are included in Alternative 1.
- Legacy trees in the International Plaza would not be removed.

Construction activities associated with this alternative are described in Section 2.6, *Construction.*

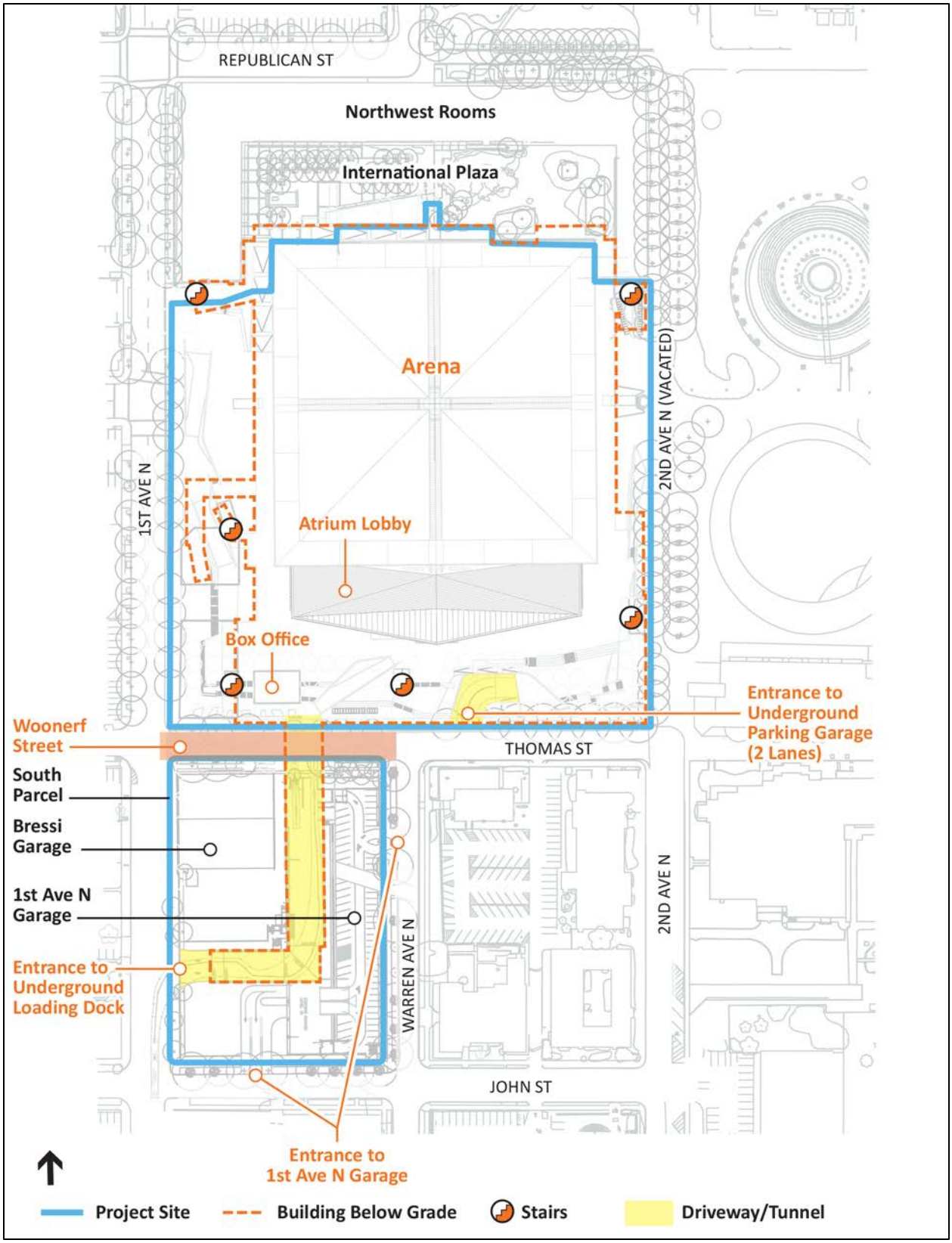


Figure 2-6. Alternative 2: Modified Proposal

2.4 COMPARISON OF ALTERNATIVES

The different components of the No Action and action alternatives are listed and summarized in Table 2-1.

Table 2-1. Comparison of Alternatives

Specifications	No Action: 2020 Scenario	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
KeyArena Building			
KeyArena (designated Landmark)	No change	• Internal renovations. • Landmark-designated features would be preserved or restored including the roof, edge beam structure, pylon, and the north, west, and east curtain walls. The glass in the north, west, and east curtain walls would be replaced in-kind. • Larger cupola on top of the roof for additional exhaust fans (more than 50% larger, but not taller, than the existing cupola). • Atrium lobby would encase the existing pylon. • The south façade glass would be removed and not replaced. • Approval from the Landmarks Preservation Board would be required.	Same as Alternative 1.
Atrium Lobby	No atrium	• A new glass atrium lobby would be added to the south of the renovated arena. • Primary entry to the arena. • Atrium lobby would not be wider than the arena.	Same as Alternative 1.
Arena Interior Square Footage	360,000	750,000	Same as Alternative 1.
Leadership in Environmental Energy and Design (LEED)	No change – does not currently meet LEED standards.	Meet a minimum LEED threshold.	Same as Alternative 1.
ADA Design and Facilities	No change – does not meet all ADA requirements.	Would meet ADA requirements.	Same as Alternative 1.

Specifications	No Action: 2020 Scenario	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Plazas and Structures Surrounding KeyArena			
Blue Spruce	No change	Removed and not replaced – tenants relocated.	Same as Alternative 1.
Skatepark	No change	Removed and replaced off-site – City is working with the skateboard community to find a new site.	Same as Alternative 1.
Seattle Center Pavilion	No change	Removed and not replaced – events that use this facility may relocate to other event spaces on the Seattle Center campus.	Same as Alternative 1.
West Court Building (existing Box Office)	No change	Removed. A new box office and retail space would be located in the south plaza.	Same as Alternative 1.
NASA Building	No change	Removed and not replaced – storage moved to another location on Seattle Center campus.	Same as Alternative 1.
Restroom Pavilion	No change	Removed and not replaced.	Same as Alternative 1.
Bressi Garage (designated Landmark; houses Seattle Center maintenance shop and storage facility and Pottery Northwest)	No change	• Loading dock access tunnel under Bressi Garage. • Exterior masonry walls of Bressi Garage would be restored (e.g., in-kind tuck-pointing and cleaning) as necessary. • Possible disassembly and reassembly of the building, if the access tunnel is constructed as open cut. • Approval from the Landmarks Preservation Board would be required.	• Loading dock access tunnel to the east of Bressi Garage. • Exterior masonry walls of Bressi Garage would be restored, if necessary.
Signage	No change	• The sign on top of the arena would be larger and brighter than the existing sign. • The 1st Ave N reader board would have digital video display and be larger and brighter than the existing sign. • The new atrium lobby would include video-capable digital signage. • Digital wayfinding signs and reader boards would be located in all plazas. • Digital signage on Thomas St for the garage entrance. • Variance required to comply with Sign Code.	• Signs would be similar to existing conditions. • New sign on top of the arena and display sign on 1st Ave N would be similar in size and brightness as the existing sign. • No variance required.

Specifications	No Action: 2020 Scenario	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Trees	No change	• Up to 9 trees designated as exceptional, legacy, and/or street trees would be removed. • Trees replaced 2:1 or greater ratio.	• Up to 5 trees designated as exceptional, legacy, and/or street trees would be removed. • Legacy trees in the International Plaza would not be removed. • Trees replaced at 2:1 or greater ratio.
KEXP, Vera Project, SIFF Film Center, and A/NT Gallery	No change	No change to the tenants.	Same as Alternative 1.
Plazas / Outdoor Space	No change	• All plazas would be redesigned and landscaped to provide a more open setting. • Exterior entry stairs around the arena would be removed; grade would be more level and meet ADA requirements.	Same as Alternative 1.
Northwest Rooms & International Plaza (designated Landmark)	No change	• The equipment and exterior enclosure on the west side of the A/NT Gallery portion of the building may be removed. • The existing tunnel underneath the International Plaza would be repaired or capped and filled. • In the International Plaza, the existing hardscape would be removed and replaced, a permanent overlook and east-west oriented ADA ramp would be installed, and existing art would be stored and reinstalled. • Approval from the Landmarks Preservation Board would be required.	Same as Alternative 1.
New Box Office	NA	• Located southwest of the arena in plaza.	Same as Alternative 1.
Artwork	No change	Remove and/or relocate artwork in accordance with SMC 3.14.840 (Deaccessioning and Disposition of Surplus Artworks).	Same as Alternative 1.

Specifications	No Action: 2020 Scenario	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Transportation Related			
On-site Parking	No on-site parking.	• 450 spaces on-site below-grade. • 3-lane driveway entrance from Thomas St.	• 200 spaces on-site below-grade. • 2-lane driveway entrance from Thomas St.
1st Ave N Garage	1st Ave N Garage - 620 spaces.	• The John St entrance would be reconfigured and 1st Ave N entrance removed. • The existing parking garage would not be changed structurally. • Equipment on roof deck of garage would remove some parking spaces.	• Same as Alternative 1, except 1st Ave N Garage use capped at 400 spaces.
Truck Loading	On Warren Ave N, Thomas St, and 2nd Ave N and in parking lot directly south of KeyArena. In compliance with the SDOT/Seattle Center MOA Event Curbside Management (2011).	• Below-grade. • 8 loading bays. • Entrance to the loading dock from 1st Ave N. • Access tunnel under the Landmark-designated Bressi Garage and Thomas St.	• Below-grade. • 8 loading bays. • Entrance to the loading dock would be farther north along 1st Ave N than Alternative 1. • Access tunnel under the 1st Ave N Garage and Thomas St. • Generally, in compliance with the SDOT/Seattle Center MOA Event Curbside Management (2011).
TNC (Transportation Network Companies)	No TNC Plan.	TNC Plan –TNC drop-off is unregulated (no geofencing); after a large event at Seattle Center, pick-up by TNCs would be managed by geofencing. There would be 4 or 5 pick-up locations within the geofence, all other pick-up would be outside of the geofence.	TNC Plan – TNC drop-off is unregulated; after a large event at Seattle Center, pick-up would be restricted to outside the geofence, and there would be no pick-ups inside the geofence.
Woonerf	Not provided.	Not provided.	Woonerf included at Thomas St between 1st Ave N and Warren Ave N, which would be closed to vehicles during arena events.
Street Closures during Events	Occasionally but not usually (e.g., during large festivals).	Same as No Action Alternative.	Same as No Action Alternative, except the woonerf would be closed to vehicles during events.

Specifications	No Action: 2020 Scenario	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Operations			
Seating Capacity: Hockey	10,442	17,500	Same as Alternative 1.
Seating Capacity: Basketball	17,072	18,350	Same as Alternative 1.
Seating Capacity: Concerts	17,459	19,125	Same as Alternative 1.
Outside Events associated with an Event at the Arena	Infrequent	Infrequent	Infrequent
Number of Events at the Arena (Approximate)[1]			
NBA Games/Year	0	50	Same as Alternative 1.
NHL Games/Year	0	50	Same as Alternative 1.
WNBA/Year	19	23	Same as Alternative 1.
Concerts/Year	29	40 to 55	Same as Alternative 1.
Other Types of Shows (e.g., family shows) or Sporting Events/ Year: Attendance 5,000 to 15,000	22	43	Same as Alternative 1.
Community Events (hosted by the City)	7	14	Same as Alternative 1.
[2]Other Events/ Year: Attendance up to 5,000	25	22	Same as Alternative 1.
Total Events/Year	102	242 to 257	Same as Alternative 1.
[3]Average Events / Week	2 to 3/week	4 to 5/week	Same as Alternative 1.

[1] The number of events for the No Action Alternative is based on data for 2016 and 2017 provided by Seattle Center. For Alternatives 1 and 2, the number of events proposed by OVG reflects a full schedule with both NBA and NHL teams.
[2] Other events include corporate events and speakers.
[3] Does not consider seasonal variations; thus, some times of the year would have more events.

2.5 SCHEDULE OF EVENTS

Figure 2-7 summarizes the general schedule of events at the arena, which would be the same for both action alternatives. The solid lines indicate season games, and the dashed lines indicate pre- and post-season games, including playoffs. The No Action Alternative would be the same, but without NBA and NHL games.

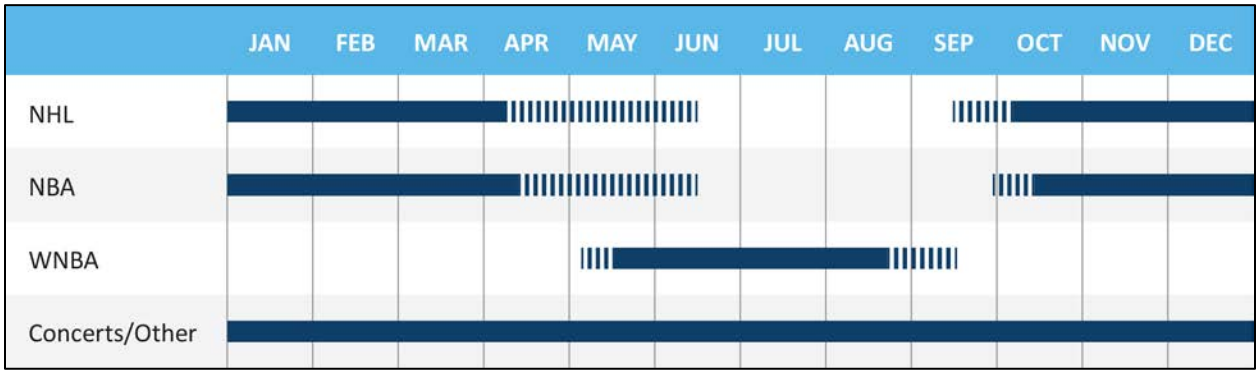


Figure 2-7. Schedule of Events at the Arena

2.6 CONSTRUCTION

Construction for Alternative 1 would occur from approximately October 2018 to October 2020, a duration of approximately 24 months. Because of the dynamic nature of construction, the sequencing, extent, and timing of construction activities would vary, and timelines shown are approximate.

Construction for Alternative 2 would be similar to Alternative 1, except no night work would occur outside of the building (including no night truck hauling). This would extend the demolition and excavation period by at least 6 months, and total construction would take at least 30 months under Alternative 2. Work would occur during "daytime," between 7:00 AM and 7:00 PM on weekdays, and between 9:00 AM and 7:00 PM on weekends and legal holidays (SMC 25.08.425). Truck hauling would be further restricted to avoid peak periods. Additionally, street closures for Alternative 2 would be different than with Alternative 1. See Table 2-2 for a side-by-side comparison of alternatives and Chapter 4, *Transportation,* for construction activities specific to that element. Construction is generally divided into 3 phases (demolition & excavation, construction, and close-out), as described below. Demolition & excavation would be the most intense phase.

- **Demolition & Excavation (Approximately Months 1–6 for Alternative 1 and Months 1–12 or longer for Alternative 2)**
  - Set up for construction operations (e.g., staging, tree protection).
  - Work would begin with exterior demolition and installation of earth retention systems including soldier piles immediately outside of the foundation walls around the perimeter of the arena. Additionally, the south ends of the Northwest Rooms would be stabilized for adjacent excavation (Figures 2-2 and 2-6).
  - Method of installation for the soldier piles has not yet been determined, but pile driving is unlikely to be used.
  - Cranes would be used to drill deep holes at the perimeter of the arena to temporarily support the arena roof structure.

- The breezeway of the Northwest Rooms may be altered for construction equipment to access the north plaza. This would include shoring of walls of the Northwest Rooms. The existing tunnel under the plaza would either be repaired or capped and filled. The breezeway may be used for access periodically throughout the construction period.
- For Alternative 1, up to 200 workers would work 2 extended or 3 shifts daily (between 400-–600 total daily construction workers); Alternative 2 would be limited to 1 extended or 2 shifts daily.
- Demolition of the interior of the arena and removal of demolition material from the project site.
- Demolition of exterior structures (Blue Spruce Building, skatepark, Seattle Center Pavilion, West Court Building [existing box office], Restroom Pavilion, and NASA Building).
- Demolition of plazas, including existing hardscape and removal of existing trees and vegetation.
- Excavation of building below-grade (see Figures 2-2, 2-4, and 2-6 for extent of building below-grade).
- Removal of demolition and excavation materials.
- Most demolition and excavation materials would be removed from the project site from the west side of the arena and transferred to trucks on 1st Ave N, and to a lesser extent from the east side of the arena to the vacated portion of 2nd Ave N on the Seattle Center campus, or to the closed north lane of Thomas St between 2nd Ave N and Warren Ave N.
- For Alternative 1, truck hauling would occur 7 days a week, 18 hours a day, for approximately 6 months (see Table 2-2). For Alternative 2, truck hauling would be limited to daytime, non-peak, hours (approximately 8 hours a day or less) and would last at least 12 months.
- Impact equipment (including impact hammers, concrete saws, concrete cutters, and vibratory compactors) would be used for demolition inside and outside of the arena.
- A concrete crusher would be used to recycle concrete and reduce the number of trucks.

- **Construction (Approximately Months 2–24 for Alternative 1 and Months 2–30 or longer for Alternative 2)**
  - Construction includes renovation of the interior and exterior of the arena and plazas, and construction of the underground parking garage and underground loading dock, atrium lobby, loading dock access tunnel, reconfiguration of the 1st Ave N Garage, and installation of equipment on the 1st Ave N Garage.
  - Construction would begin approximately 2 months after demolition starts.
  - Under Alternative 1, steel may be erected at night (for interior construction). Impact wrenches would be used for steel erection. This would be used during early phases of foundation, garage, and superstructure construction. The duration of these activities would be 12 months. Under Alternative 2, the use of impact equipment inside the arena would only be allowed if its use meets the requirements of SMC 25.08.425.

- **Closeout (The last 2 months of Construction for Both Alternatives)**
  - Finishing outdoor plaza work.

- Landscaping.
- Restriping.
- Exterior finishes on arena, including the installation of roof equipment.
- Sign installation.

The Development Agreement, an agreement between the City and OVG, will identify protocols to minimize effects of construction on existing activities at Seattle Center. This agreement is proposed to be finalized after publication of the Final EIS; the Final EIS will be used to inform that agreement.

Table 2-2 lists the construction activities for Alternatives 1 and 2. No construction is anticipated under the No Action Alternative.

Table 2-2. Construction Activities for Alternatives 1 and 2

Specifications	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Construction duration	Approximately 24 months.	At least 30 months.
Night Work		
Night work outside the arena	Night work only during the demolition and excavation phase (months 1–6).	No night work.
Night work inside the arena	Night work for the duration of the project (24 months). Night work would be the most intense during the demolition and excavation phase (months 1–6).	Night work only as allowed under SMC 25.08.425.
Impact equipment	Demolition & Excavation Phase (months 1–6) – Impact equipment may be used during the day and night inside and outside of the arena. Outside of the arena, use of impact equipment would be frequent during the day and limited at night: • Pile driving (occasional) • Impacts hammers • Concrete saws • Concrete cutters • Vibratory compactors • Concrete crusher Construction Phase (months 2–24) – Impact equipment may be used during the day and night inside and outside of the arena; would be used less than during demolition and excavation, and night use would be occasional: • Impact wrenches (for steel erection)	Same as Alternative 1, except no night-time use of impact equipment unless allowed under SMC 25.08.425.

Specifications	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Excavation		
Arena	The arena would be excavated an additional 15 feet (to 53 feet deep). Excavation would also occur laterally, extending the inside of the arena to out beyond the base of most of the pylons (Figures 2-2, 2-4, and 2-6). The arena would be stabilized prior to construction.	Same as Alternative 1.
Underground parking garage and underground loading dock	Excavation would be open pit, and take 3–4 months (Figure 2-4).	Same as Alternative 1.
Loading dock access tunnel	The access tunnel would be excavated using a tunnel boring/mining method, auger, or open-cut construction. For tunneling/mining or augering, Bressi Garage would be stabilized. If open cut is used, Bressi Garage would be disassembled, stored, and reassembled after construction. Estimated to take 6 months. See Figure 2-2 for tunnel location.	The method of construction would be the same as Alternative 1, except open cut would be less likely. The access tunnel would pass under the 1st Ave N Garage, east of Bressi Garage. See Figure 2-6.
Excavation volume (cubic yards)	Approximately 500,000 cubic yards.	Same as Alternative 1.
Estimated number of truck trips[1]	• Approximately 25,820 truckloads = 51,640 truck trips for months 1–6. • 73,000 truck trips for months 7–18. • 10,800 truck trips for months 19–24. • 135,500 total truck trips.	• Approximately 51,640 truck trips for months 1–12. Restriction of night truck trips could extend the duration of truck hauling beyond 12 months. • 73,000 truck trips for months 13–24. • 10,800 truck trips for months 25–30. • Approximately 135,500 total truck trips.
Estimated number of truck trips[1] (per day)	• 290 per day for months 1–6. • 80–100 per day for months 7–18. • 20–30 per day for months 19–24.	• 130 per day for months 1–12. • 80–100 per day for months 13–24. • 20-30 per day for months 25–30.
Transportation		
Truck hauling at night	Truck hauling would occur 18 hours a day (would avoid AM/PM peak periods), 7 days a week.	Truck hauling during daytime, non-peak hours only (approximately 8 hours a day or less), 7 days a week.
Truck haul route	Likely to use major (arterial) truck streets including: • 1st Ave N to access Mercer St. • Mercer St east to I-5 or west to Elliott Ave. • Denny Way west from I-5 to 1st Ave N, Warren Ave N, or 2nd Ave N (including on Seattle Center campus). Would be restrictions on haul routes, such as avoiding AM/PM peak periods. Hauling through	Same as Alternative 1, except no truck hauling at night. Likely only between 8:30 AM and 3:30 PM.

Specifications	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
	Seattle Center campus would be limited to between 12:00 AM and 6:00 AM, except as approved by Seattle Center.	
Street closures	Closed for the duration of construction (24 months): • Thomas St between 1st Ave N and Warren Ave N. • Thomas St between Warren Ave N and 2nd Ave N, all but the south curbside lane closed; south curbside lane used for 1-way traffic. • Western half of vacated 2nd Ave N from Thomas St to the south edge of the Northwest Rooms. • 1st Ave N, east curbside parking lane between John St and the King County Metro Bus stop closed for approximately months 1–18 and intermittently for months 19–24.	Closed for the duration of construction (30 months or longer): • Thomas St between 1st Ave N and Warren Ave N; location the same as Alternative 1. • Thomas St between Warren Ave N and 2nd Ave N north curbside lane and north travel lane closed; south travel lane and south curbside lane would be available for event support. • Western half of vacated 2nd Ave N from Thomas St to the south edge of the Northwest Rooms; location the same as Alternative 1. • 1st Ave N, east curbside parking lane between John St and the King County Metro Bus stop closed for months 1–24 and intermittently for months 24–30 or longer; location the same as Alternative 1. Duration of closures could be extended due to night-time hauling restrictions.
Truck queuing	• On 1st Ave N between John St and the King County Metro Bus stop. • On 2nd Ave N between John St and Thomas St. • On Thomas St, between Warren Ave N and 2nd Ave N.	Same as Alternative 1.
1st Ave N Garage and adjacent surface parking lot	The existing 1st Ave N Garage and adjacent surface parking lot may be used for temporary staging and construction parking and would likely remain partially open, with limited access and parking spaces during construction.	Same as Alternative 1.
Construction easement	Would extend outside of the project site for tieback of construction. To the north and east of the arena, construction easements would extend past the project site, into the Seattle Center campus. To the west and south of the arena, construction easements may extend into the immediately adjacent streets. For the access tunnel and utility work, construction easements would extend into the adjacent streets. Such work would require excavation, including within the existing road right-of-way.	Same as Alternative 1.

Specifications	Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Other		
Northwest Rooms and International Plaza	• The Northwest Rooms breezeway may be altered to accommodate periodic construction equipment access. • Most of the International Plaza would be closed during construction for work on the plaza and arena. • The existing below-grade tunnel would be repaired or capped and filled. • Shoring may extend into the International Plaza and adjacent to the Northwest Rooms. • The DuPen Fountain would be closed during construction, and artwork from the DuPen Fountain would be stored during construction.	Same as Alternative 1.
Tenant relocation	• Pottery Northwest (the tenant in Bressi Garage) would relocate during the 2-year construction period. • Tenants in the Northwest Rooms (KEXP, Vera Project, SIFF, and A/NT Gallery) or some of their activities may need to relocate for portions of construction.	Same as Alternative 1, except the duration would be longer.

[1] The number of truck trips for demolition and excavation is estimated based on the volume of excavated material and volume of material that would need to be removed from demolition of a 360,000 square foot building. Assumed approximately 20 cubic yards/truck load (1 truck load = 2 truck trips). CalEEmod model determined that a 360,000 square foot building would result in 818 truckloads of material. This number does not include other types of construction vehicles. To calculate the number of truck trips per day for demolition and excavation for Alternative 1, 180 days (approximately 6 months) was assumed; for Alternative 2, 360 days (approximately 12 months) was assumed.

3.0 LAND USE

This chapter provides an analysis of land uses within the study area and potential land use impacts from the proposed project. A discussion of the project's consistency with existing plans and zoning is also included. Land use is a broad topic that intersects with other elements of the environment, including recreation, traffic, and noise. The potential traffic impacts are more fully analyzed in Chapter 4, *Transportation*, potential impacts on visitors in Chapter 7, *Recreation*, and noise impacts in Chapter 8, *Noise*.

Key Findings for Land Use

Direct Impacts: Alternatives 1 and 2 propose to demolish several buildings and the tenants may be temporarily or permanently displaced. The skatepark would be permanently removed. Seattle Center tenants, neighboring residents, businesses, and institutions would experience construction impacts for approximately 24 months under Alternative 1 and 30 months or longer under Alternative 2.

Alternative 1 proposes Seattle Municipal Code zoning code variance requests for signage and curb cuts under Title 23. It also proposes a request for a variance from the Seattle Noise Ordinance from night-time noise construction under Title 25. Alternative 2 proposes a variance for curb cuts.

Indirect Impacts: Alternatives 1 and 2 propose an increase in frequency of events at the renovated arena which would add to the congestion and overall activity in Uptown and surrounding neighborhoods.

3.1 METHODS

Current zoning and land uses were identified by reviewing local, state, and regional maps and planning documents, including online resources and plans from the City and Seattle Center. Construction impacts were analyzed by identifying construction activities that could temporarily limit, disrupt, or displace current land uses in the study area. Operations impacts were analyzed by identifying long-term activities associated with the renovation of the arena that could affect existing on-site or adjacent land uses.

3.2 REGULATORY CONTEXT

The proposed project is subject to land use review under SEPA regulations, the Seattle Municipal Code (SMC), City regulatory plans, and other local, state, and regional codes. Washington Administrative Code (WAC) 197-11-440 (6)(d)(i) requires a summary of existing plans (for example: land use and shoreline plans) and zoning regulations applicable to the proposal, and how the proposal is consistent and inconsistent with them. Consistency with regulatory plans and policies is described in Section 3.7, *Relationship to Plans, Policies, and Regulations.*

3.3 AFFECTED ENVIRONMENT

3.3.1 Land Use Study Area

The land use study area is generally bounded by Mercer St to the north, 5th Ave N and Broad St to the east, Denny Way to the south, and Queen Anne Ave N to the west (see Figure 3-1) and includes adjacent areas beyond the boundaries of Seattle Center. The northern boundary extends to Roy St to include the Mercer St Garage. The area is near the north boundary of the Downtown Urban Center in Uptown. Uptown is surrounded by Interbay to the west, South Lake Union to the east, Denny Triangle to the southeast, and Belltown to the south.

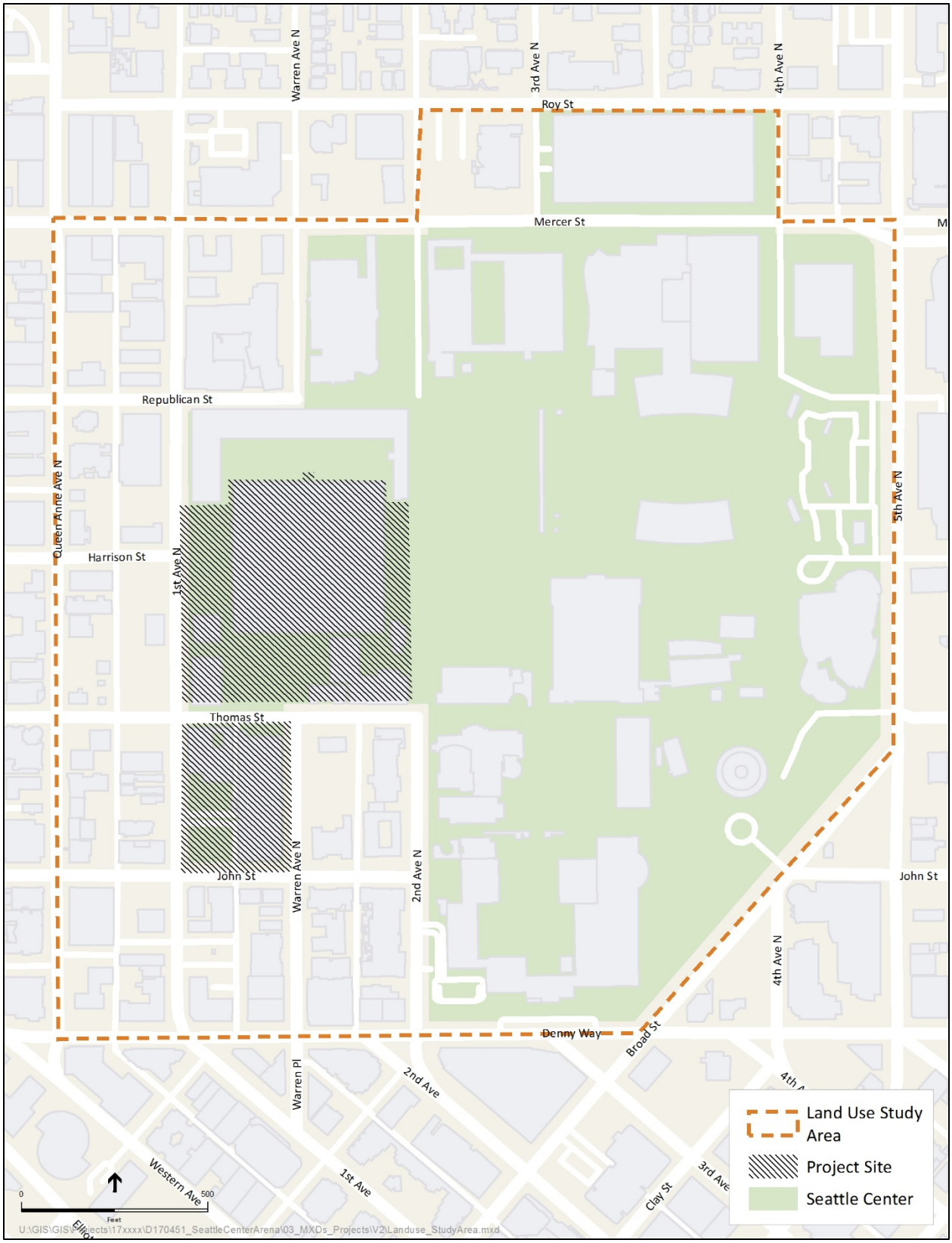


Figure 3-1. Land Use Study Area

3.3.2 Existing Land Uses on the Seattle Center Campus

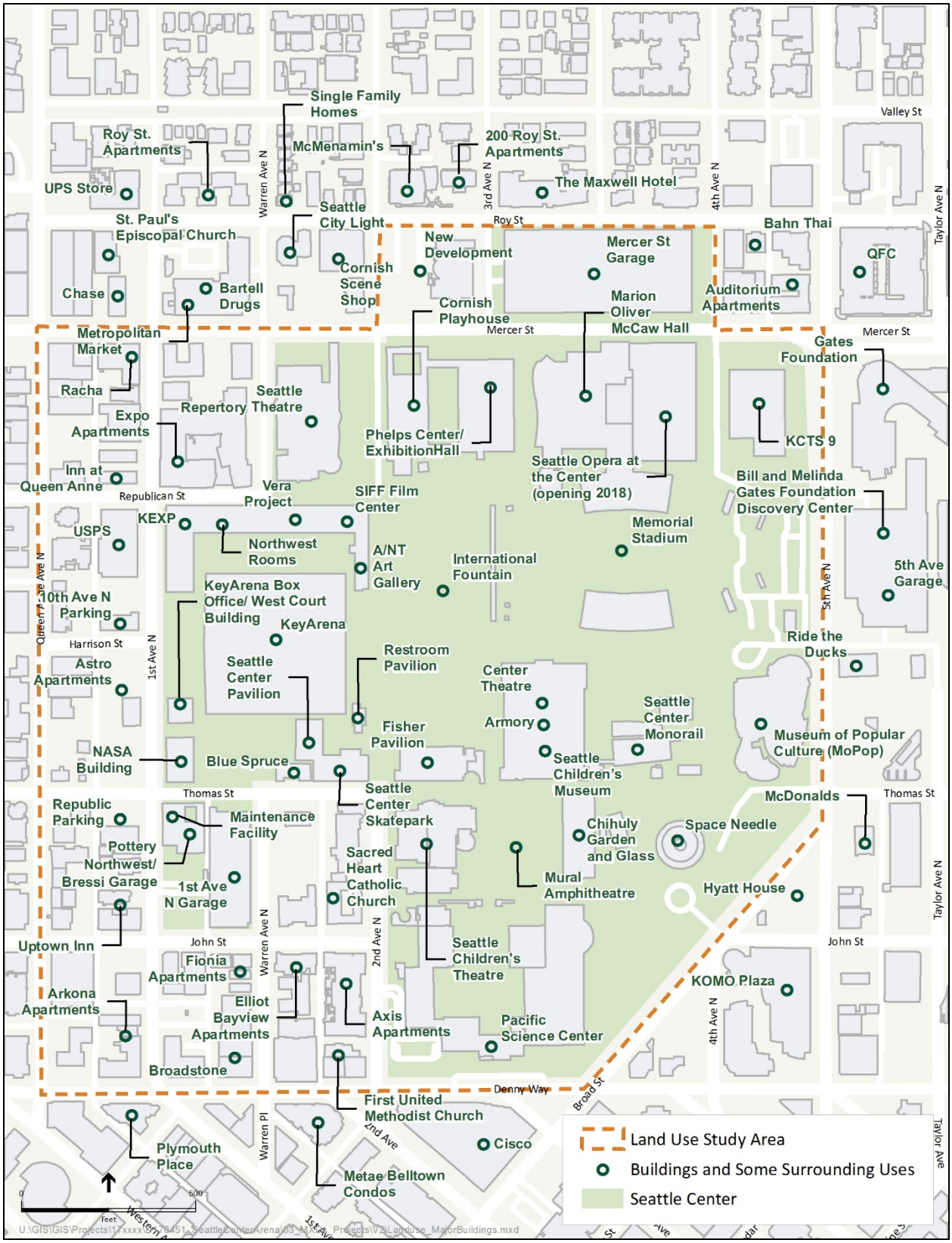
The project site is on the Seattle Center campus. Land within the Seattle Center campus is owned by the City or private entities and is currently developed with a variety of existing uses including performance, entertainment, sports, recreation, museum, commercial, office and storage buildings, and surface and structured parking (see Figure 3-2). The Seattle Center campus includes public spaces such as open lawn areas that contribute to Seattle Center's park-like feel, and large paved public spaces important for festival and exhibition programming, performance and artistry, informal enjoyment of the out-of-doors, and small and large gatherings. Major buildings at Seattle Center include the Armory, Museum of Popular Culture (MoPop), the Seattle Children's Theatre, the Space Needle, Seattle Opera, Memorial Stadium, McCaw Hall, Pacific Science Center, Chihuly Garden and Glass, Phelps Center/Exhibition Hall, Cornish Playhouse, Seattle Repertory Theatre, and KeyArena. Some of the buildings are operated by Seattle Center (e.g., KeyArena and the Armory), and others are privately operated (e.g., Space Needle, Memorial Stadium, Pacific Science Center, and MoPop). See Appendix E, *Recreation*, for a list of buildings and activities at Seattle Center.

Main entrances to the Seattle Center campus include 2nd Ave N and Thomas St, 1st Ave N, Seattle Monorail Terminal on 5th Ave N, W Harrison St and 5th Ave N, 3rd Ave N and Mercer St, and Warren Ave N and Republican St (August Wilson Way).

The existing KeyArena building and adjacent area proposed for the Seattle Arena Renovation Project comprise approximately 11 acres of the Seattle Center campus. KeyArena currently has a capacity of approximately 17,000 persons depending on the type of event. Buildings that are currently located on the project site are listed in Table 3-1.

Table 3-1. Existing Buildings on the Project Site

Building Name	Current Use
KeyArena	Performance, entertainment, and sports venue.
KeyArena Box Office/ West Court Building	Ticketing services and offices.
Seattle Center Pavilion	The building is a flexible 5,300-square foot space that is rented for events.
Blue Spruce	Repurposed apartment building that currently functions as office space for nonprofit organizations.
Seattle Center Skatepark	Recreational skatepark.
Restroom Pavilion	Public access restrooms.
Bressi Garage - Pottery Northwest and Seattle Center Maintenance Facility	Half of the building is used as a ceramics studio by tenant Pottery Northwest. Seattle Center maintenance and grounds staff use the other half of the building for office space and storage for equipment, including maintenance vehicles.
NASA Building	Repurposed building used for storage.
1st Ave N Garage	Seattle Center public parking, constructed for use by KeyArena during 1994/1995 renovation.



Source: Prepared by ESA, 2018.

Figure 3-2. Buildings and Some Surrounding Uses

Tenants currently programmed at KeyArena are listed in Table 3-2.

Table 3-2. Current KeyArena Tenants

Current KeyArena Tenant	Programming
Seattle Storm (WNBA)	The Storm hosts 17 regular season games, 1 pre-season game, and a variable number of post-season games at KeyArena (WNBA, 2017).
Seattle University Men's Basketball Team	The Seattle University Men's Basketball Team plays Division I National Collegiate Athletic Association (NCAA) basketball, with KeyArena as their home court. The team played at the Seattle Center Coliseum from 1964–1980 and returned to KeyArena in 2008.
Pac12 Women's Basketball Tournament	The PAC12 Women's Basketball Tournament has been held in KeyArena since 2013.
Concerts and Special Events	Variety of schedules for entertainment.

3.3.3 Land Uses Adjacent to the Project Site

The uses directly adjacent to the project site include the following (see Figure 3-2):

North of KeyArena: KEXP, Seattle International Film Festival (SIFF) Film Center, Vera Project, and A/NT Gallery (formerly known as Art/Not Terminal Gallery) (i.e., Northwest Rooms and International Fountain Pavilion buildings), and the DuPen Fountain of Creation are immediately north of the project site on the Seattle Center campus. To the north of those buildings are Republican St, the Seattle Repertory Theatre, and Theatre Commons.

South of KeyArena: Thomas St is immediately south of the project site. Across Thomas St to the south is the Sacred Heart of Jesus Catholic Church and Rectory, the Sacred Heart Shelter, and the Downtown School. Southeast of the project site is the Seattle Children's Theatre. John St is south of the existing 1st Ave N Garage and surface parking. South of John St are condominiums and apartments.

East of KeyArena: The Fountain Lawn, International Fountain, South Fountain Lawn, and Fisher Pavilion on the Seattle Center campus are east of the project site.

West of KeyArena: 1st Ave N is west of the project site. Adjacent to 1st Ave N are apartments and condominiums, including the Astro Apartments, MightyKidz Daycare, several surface parking lots, and the Queen Anne Post Office Building (also known as the Queen Anne Station).

3.3.4 Land Uses Within the Land Use Study Area

Most of the study area to the east and north of the project site is within Seattle Center. West and south of the project site, the neighborhood character transitions to smaller lots, a regular street grid, and a mix of mid-rise and low-rise commercial, residential, and institutional uses. Queen Anne Ave N from Denny Way to the south to Mercer St to the north forms the center of a pedestrian-oriented commercial district that includes dining, entertainment, shopping, and offices that extends for several blocks along both of these arterial streets. Uses within and adjacent to the land use study area include those listed below and found on Figure 3-2:

North Boundary of the Land Use Study Area: Mercer St and Roy St form the north boundary of the land use study area and are adjacent to apartments and condominiums, single-family residential, commercial retail, and utility uses.

South Boundary of the Land Use Study Area: Denny Way creates the south boundary of the land use study area. First United Methodist Church, Pacific Science Center, apartments and condominiums, surface parking, and commercial retail establishments are adjacent to Denny Way to the south.

East Boundary of the Land Use Study Area: 5th Ave N and Broad St border the east boundary of the land use study area. KCTS 9, Museum of Pop Culture (MoPop), surface parking, and a variety of commercial retail establishments are along the eastern boundary of the land use study area.

West Boundary of the Land Use Study Area: Queen Anne Ave N from Mercer St to the north to Denny Way at the south forms the west boundary of the land use study area and are adjacent to a mix of commercial, retail, offices, apartments, condominiums, restaurants, and parking.

In addition to a few single-family residences, there are approximately 24 multi-family developments in the land use study area, totaling approximately 1,650 housing units. These units are predominantly rental units. Table B-1 in Appendix B lists many of the multi-family housing units in the land use study area.

Two religious institutions in the land use study area provide religious and social services: the Sacred Heart of Jesus Catholic Church, Rectory, and Shelter at 205 2nd Ave N; and the First United Methodist Church and Blaine Center at 180 Denny Way. Religious services and other programming are listed in Table B-2 in Appendix B.

Several new development projects are proposed or under construction in the land use study area. Proposed projects include those that have received land use and/or construction permits, or are currently undergoing SDCI review. At the time of Draft EIS preparation, 3 permit applications were listed in the SDCI permit tracking system for proposed large apartment or condominium buildings in the land use study area. The permit numbers and addresses for projects in the building application system that may be starting up or be in progress at the time of the proposed arena renovation include the following:

- Permit #3025946, 225 Roy St, 2 apartment buildings, one 8-story and one 7-story, with a total of 269 units.
- Permit #3024089, 320 Queen Anne Ave N, 7-story building with 69 units.
- Permit #3021477, 215 1st Ave N, 5-story building with 71 units.

3.3.5 Current Land Use Zoning

The entire land use study area is zoned Seattle Mixed-Uptown (SM-UP) with varying height limits, as shown in Figure 3-3. The project site on the Seattle Center campus is listed as SM-UP 95, which designates a height limit of 95 feet for the parcels in that zone. The area south of Thomas St (the south parcel) where additional project work is planned is zoned SM-UP 85. Other parcels in the land use study area have height limits ranging from 40 to 85 feet.

The SM-UP zoning designation, adopted in October 2017, aims to create a more walkable, livable, and dense Uptown. The SM-UP zone provides for a wide range of uses in medium- to high-density mixed-use development, and includes regulations for the following:

- Maximum building height, width, and façade standards.
- Street-level use and parking standards.
- Maximum and minimum development density.
- Mandatory affordable housing contributions.
- Incentive zoning for provision of public amenities.

3.4 POTENTIAL IMPACTS

This section evaluates potential impacts to land uses for the No Action Alternative and Alternatives 1 and 2.

3.4.1 Construction Impacts

Potential short-term land use impacts from construction are characterized as less-than-significant or significant. Potentially significant impacts are defined below; impacts that do not reach that threshold are determined to be less-than-significant.

Criteria for Significant Construction Impacts: The impacts of construction activities would be significant if disruptive (e.g., noise, dust, visual impediments, access limitations) and of long enough duration to result in a change in the current land use in the land use study area.

No Action Alternative

Under the No Action Alternative, there would be no demolition or construction at the site for a renovated arena or associated improvements. The existing KeyArena would remain as is.

Direct Impacts and Indirect Impacts

No direct or indirect land use impacts would be expected from the No Action Alternative.

Alternative 1: OVG Proposal

Alternative 1 proposes to renovate the interior of KeyArena for sports and entertainment events with a design that would accommodate NHL and NBA teams. The project includes demolition and construction on the project site to renovate the facility. See Chapter 2 for a detailed description of Alternative 1. Construction activities are described in Section 2.6, *Construction.*

Direct Impacts

Construction activities would involve the demolition of existing structures, day- and night-time noise, temporary street closures, temporary closures of portions of Seattle Center grounds, and temporary displacement of existing programming or uses. The activities would individually and cumulatively affect neighboring uses. Construction activities are not expected to be disruptive enough to adjacent land uses to cause a change in land use, but would cause inconveniences. For additional information on noise, see Chapter 8, *Noise*. Permanent displacement of uses is described in Section 3.6.2, *Operational Impacts.*

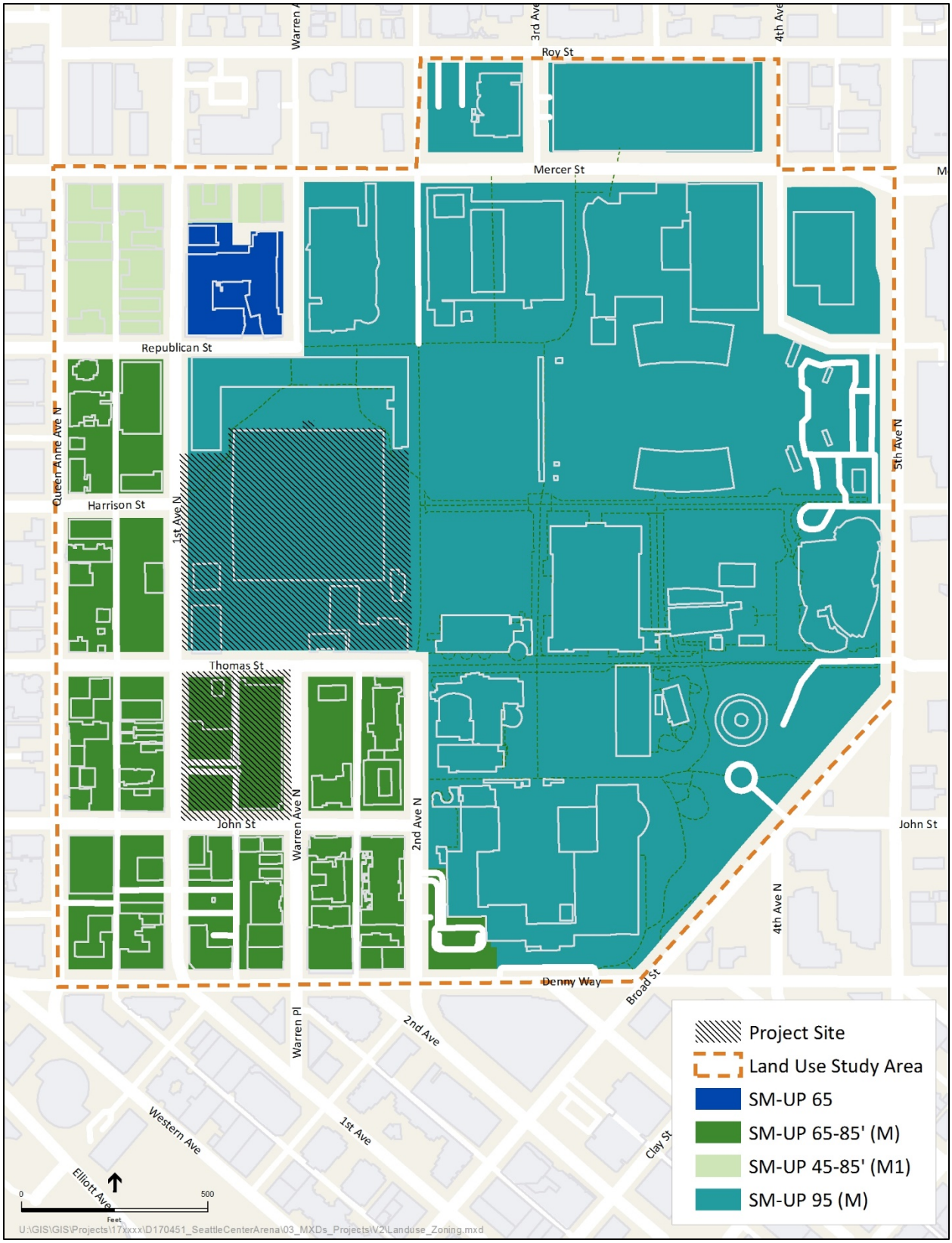


Figure 3-3. Land Use Zoning in the Land Use Study Area

Demolition of Existing Structures: Five buildings (West Court Building [KeyArena Box Office], NASA Building, Blue Spruce Building, Restroom Pavilion, and Seattle Center Pavilion), the skatepark, surface parking lot and loading/marshalling area south of the arena, and plazas to the west and east of the arena would be demolished. The demolition of the Blue Spruce Building was supported in the Century 21 Master Plan.

Temporary Street Closures: Streets proposed for closure for the duration of construction (approximately 24 months) would impact current Seattle Center tenants, visitors, and neighboring land uses by requiring detours or changes in access to the Seattle Center, residences, and businesses. The street closures are listed below.

Closed for the duration of construction (24 months):

- Thomas St, between 1st Ave N and Warren Ave N.
- Thomas St between Warren Ave N and 2nd Ave N, all but the south curbside lane closed; south curbside lane used for 1-way traffic.
- Western half of vacated 2nd Ave N from Thomas St to the south edge of the Northwest Rooms.

Closed for months 1–18 and intermittently for months 19–24:

- 1st Ave N, east curbside lane between John St and the King County Metro Bus stop.

Access would be maintained to all businesses, residences, and institutions during construction.

Temporary Construction Impacts on Seattle Center and Adjacent Uses: Seattle Center averages 12 million visitors per year and hosts approximately 5,000 events and performances. A number of these events would have some level of disruption for the duration of the 2-year construction from:

- Closure of the International Plaza north of the arena.
- Closure of the west half of vacated 2nd Ave N, adjoining Fisher Pavilion, South Fountain Lawn, and International Fountain and Lawn.
- Loss of event-related curb space on Thomas St.

The proposed street closures would be an inconvenience to Seattle Center tenants, visitors, and adjacent neighbors, businesses, and institutions. In particular, loading and unloading for the Seattle Children's Theatre, the Armory, the Fisher Pavilion, and festivals would be impacted and detours or other access routes and alternatives for loading and unloading would be required. See Appendix B, Tables B-3, B-4, and B-5, for detailed information on Seattle Center programming.

Temporary Displacement of Existing Programming/Uses During Construction: Renovation of the arena would temporarily displace some existing uses for approximately 24 months. Current KeyArena activities would either discontinue during the renovation or would take place in temporary venues until they could shift back to the renovated arena. The tenants of KeyArena that would be temporarily displaced are listed in Table 3-3.

Table 3-3. Current KeyArena Tenants Temporarily Displaced Due to Construction

Current KeyArena Tenant	Proposed Temporary Venue
Seattle Storm (WNBA)	The Storm would likely relocate to the Alaska Airlines Arena at University of Washington in Seattle (capacity 10,000), the Tacoma Dome in Tacoma (capacity 23,000 depending on the seating arrangement), Xfinity Arena in Everett (capacity 10,000), or the ShoWare Center in Kent (capacity 6,500).
Seattle University Men's Basketball Team	The Seattle University campus features the Connolly Center, a 999-seat arena with an NCAA-regulation court. The men's basketball team would play at the Connolly Center during the construction period.
Pac12 Women's Basketball Tournament	The Pac12 Women's Basketball Tournament would relocate outside the City for the duration of the construction period. The Pac12 has announced that the tournament will move to Las Vegas during construction (Allen, 2018).
Concerts and Special Events	The Tacoma Dome (capacity 23,000 depending on the seating arrangement) frequently hosts concerts on the same scale as those held at KeyArena (Tacoma Dome, 2016). The Tacoma Dome is currently being renovated, and renovations will be complete by fall of 2018 (Tacoma Dome, 2016). Other arenas in the greater Seattle area that could host concerts during the construction period include the Xfinity Arena in Everett (capacity 10,000), the ShoWare Center in Kent (capacity 6,500), or the Events Center at Century Link Field.

In addition to the current KeyArena tenants that may be displaced, Pottery Northwest would also likely need to relocate or temporarily close during the construction period. Pottery Northwest currently is housed in the Bressi Garage building. Half of the building is used as a ceramics studio by Pottery Northwest. Seattle Center maintenance and grounds staff use the other half of the building for office space and storage for equipment including maintenance vehicles. A tunnel would be constructed under the Bressi Garage.

Variances: Alternative 1 proposes Seattle Municipal Code zoning code variance requests for curb cuts under Title 23. A variance or code amendment would also be required for some of the signage. It also proposes a request for a variance from the Seattle Noise Ordinance from night-time noise construction under Title 25. See Section 3.7, *Relationship to Plans, Policies, and Regulations*, for details.

Indirect Impacts

During construction, indirect impacts to nearby properties and businesses could occur from the loss of on-street parking, construction noise, and construction traffic. These disturbances, concurrent with other construction projects in the study area, would create intermittent inconvenience to businesses and residents that could ultimately contribute to some residents or business patrons deciding to leave the area, or businesses deciding to relocate.

Because other regional spaces/venues have the capacity to support displaced tenant uses during the approximate 24-month construction period, and because Seattle Center has refrained from scheduling events in KeyArena during the proposed construction period and is coordinating with Pottery Northwest, such impacts to land use would be temporary, and would be considered less-than-significant.

Alternative 2: Modified Proposal

Construction for Alternative 2 would be the same as Alternative 1, except that no exterior night work (including no night truck hauling) would occur. This could extend the demolition and excavation period by up to 6 months, and total construction could take up to 30 months or longer. Construction-related impacts to land use would be at least 6 months longer in duration than under Alternative 1. Alternative 2 proposes a variance under Title 23 only for curb cuts.

Direct and Indirect Impacts

The land use impacts due to construction under Alternative 2 would be similar to Alternative 1 for both direct and indirect impacts. However, the period of most intensive construction impacts and associated construction traffic congestion impacts would extend the construction activity by approximately 6 months or more under Alternative 2. The location of construction impacts is different for the loading dock and tunnel entrance location. Alternative 2 proposes the construction of a woonerf. See Figure 2-2 in Chapter 2, *Alternatives Description*. These differences would not substantively change land use impacts from those described for Alternative 1, and the impacts would be less-than-significant.

3.4.2 Operations Impacts

This section describes potential long-term land use impacts from the proposed Seattle Center Arena Renovation Project. Potentially significant land use impacts are defined below; impacts that do not reach that threshold are determined to be less-than-significant.

Criteria for Significant Operations Impacts: Impacts would be significant if the project would result in permanent, substantial direct or indirect land use changes that adversely affect neighborhood character, such as blight or disuse of properties.

No Action Alternative

Direct Impacts

Under the No Action Alternative, there would be no expected change from existing land use conditions in and around the project site and vicinity.

Indirect Impacts

In general, land uses within the land use study area for the No Action Alternative would be expected to continue along current trends, without influence from changed activity at KeyArena. The No Action Alternative would not allow Seattle Center to achieve the economic benefits of providing expanded KeyArena facilities, and may result in KeyArena becoming less attractive as a venue to major sporting and entertainment events.

Alternative 1: OVG Proposal

Direct Impacts

Alternative 1 includes the permanent removal or alteration of several buildings on the project site, permanently displacing the uses in those buildings. See Table 3-4 for a summary of these changes.

Table 3-4. Permanent Displacement of Uses on the Project Site

Building Name	Current Use	Use Under Alternative 1
KeyArena Box Office/ West Court Building	Ticketing services.	Removed and replaced. A new freestanding box office would be constructed in the south plaza.
Seattle Center Pavilion	The building is a flexible 5,300-square foot space that is rented for events. It can be set up theater-style, classroom style, or banquet style.	Removed and not replaced. Events that were held in this venue could be held in the Armory Lofts or other Seattle Center event venues in the future.
Blue Spruce	Repurposed apartment building currently used as office space for nonprofit organizations.	Removed and not replaced, consistent with Seattle Center Century 21 Plan. Non-profit organizations would be relocated to other locations on Seattle Center campus, or to a location that suits their needs. Seattle Center is working with the tenants of the Blue Spruce.
Skatepark	Public recreation area.	Removed. See discussion in Chapter 7, *Recreation,* regarding possible replacement.
Restroom Pavilion	Public access restrooms.	Removed and not replaced.
NASA Building	Used for storing facilities maintenance equipment.	Removed and not replaced. Items stored in NASA building would be relocated to other storage facilities.

Relocation and financial assistance for the permanent displacements from the project site and the inclusion of an OVG Community Liaison are included as part of the project proposal. Because the project would provide relocation support through a Community Benefits Agreement, Community Outreach Program, or similar mechanism agreed upon between the City and OVG, the impacts would be less-than-significant.

The skatepark removal is an impact on recreation and is described in Chapter 7, *Recreation*.

Indirect Impacts

Alternative 1 would more than double the frequency of major events and provide increased seating capacity and amenities at the renovated arena. Seating capacities under Alternative 1 would range from approximately 17,500 to 19,125 for concert configurations. This is an increase in the seating capacity by approximately 1,500 to 6,500 per event, depending on the internal arena configuration. See Chapter 2, *Description of Alternatives*, for a detailed list of proposed events.

The increased frequency in events under Alternative 1 would increase visitation on the Seattle Center campus and neighboring areas. The experience for residents and businesses in the area would not substantially change on a daily basis, given that this area is currently a highly used sports, recreation, and entertainment destination. However, the increased number of days during the year with highly attended events at the Seattle Center campus would be noticeable in neighboring areas and may be a quality of life consideration for some residents.

Restaurants, bars, and other concessions at and around the Seattle Center campus would likely see an increase in use due to the increased attendance at the arena from the more frequent scheduling of major sporting and entertainment events at the arena. Continued growth and expansion of retail, restaurants, and entertainment within and around Seattle Center would support surrounding residential and job growth targets, and would likely be seen as a benefit to retail and restaurants operating in the area. KeyArena is a major revenue generator supporting Seattle Center's operational expenses. A renovated arena would represent a long-term investment that would enhance the Seattle Center's ability to meet its goal of bringing people together through a diverse set of activities and events.

Alternative 2: Modified Proposal

Direct Impacts

Alternative 2 would maintain the design of the building's Landmark-designated features as described for Alternative 1, but would reduce potential impacts to Bressi Garage, reduce visual impacts associated with signage, lessen impacts to traffic in the vicinity of the arena, and the legacy trees in the International Plaza would not be removed. In addition, in Alternative 2, the portion of Thomas St between 1st Ave N and Warren Ave N would be designed as a woonerf that would be closed to car and truck traffic during events. Operational impacts under Alternative 2 are similar or less than Alternative 1. Therefore, direct land use impacts identified in Alternative 2 would be less-than-significant.

Indirect Impacts

The indirect impacts under Alternative 2 would be similar to those described for Alternative 1 and would be less-than-significant.

3.5 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

3.5.1 Construction

Mitigation measures are implemented to lessen or eliminate the adverse impacts associated with a proposed action. Such measures can be proposed by the applicant or required as a condition of approvals for construction mitigation.

Potential mitigation measures to address displacement of existing tenants during construction include the following:

- Provide advance notice to existing tenants of the construction period.
- Coordinate with tenants who would be displaced. Provide assistance in identifying alternative locations in which to hold games, concerts, and other events. Work with Seattle Center to determine whether the displaced tenants could return to the new facility once construction is completed.
- Assist in publicizing the relocation to the potential attendees.
- Coordinate with residents and businesses in the area to provide advance notice of construction schedules and potential detour routes.
- Develop a robust marketing plan to ensure that the public knows Seattle Center and its resident organizations are open for business during construction.
- Provide an OVG Community Liaison as described in the Arena MOU.
- Follow design guidelines prescribed by the City and follow the City procedures for variances.

Mitigation measures for construction traffic, parking, noise, and aesthetic impacts are described in their respective sections (see Section 4.5.1, *Transportation*; Section 8.6.1, *Noise and Vibration*; and Section 9.6.1, *Visual Resources*).

3.5.2 Operations

Operations mitigation for Alternatives 1 and 2 may include the following:

- Provide relocation and financial assistance for permanent displacements from the project site toward relocation, including the skatepark and the campus maintenance facility.
- Provide an OVG Community Liaison, as described in the Arena MOU, to work with the community.
- Coordinate with local bars and restaurants and other businesses to incorporate traffic congestion solutions in the Transportation Management Program (TMP).

Additional mitigation measures for operations traffic, parking, noise, and aesthetic impacts are described in their respective sections (see Section 4.5.2, *Transportation*; Section 8.6.2, *Noise and Vibration*; and Section 9.6.2, *Visual Resources*).

3.6 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON LAND USE

Alternatives 1 and 2 provide for mitigation for temporary or permanent displacement of uses, adhere to the City Municipal Code (Alternatives 1 and 2 would follow the proper procedures and standards for request for variances), and provide mitigation for temporary construction impacts that would impact neighboring residents, businesses, and institutions in the area. Therefore, there would be no significant and unavoidable adverse land use impacts expected from either of the action alternatives.

3.7 RELATIONSHIP TO PLANS, POLICIES, AND REGULATIONS

This section of the EIS provides a summary and consistency analysis. Unlike potential impacts to the physical environment described in other sections of the EIS, this section summarizes the general extent to which the alternatives are consistent with zoning regulations and plans. The following analysis focuses on project consistency with relevant goals and policies of the Seattle 2035 Comprehensive Plan (City of Seattle, 2016a) and the Queen Anne (Uptown) Neighborhood Element of the Plan, the Uptown Rezone Plan Ordinance, and the Seattle Center 21 Master Plan (Seattle Center, 2008). Current land use zoning in the Seattle Municipal Code is described in detail in Section 3.7 of this chapter. The proposed project is not in a shoreline area or in or nearby an environmentally critical area. Therefore, those policies are not analyzed.

3.7.1 Consistency with the Seattle 2035 Comprehensive Plan (2016)

Summary: The Seattle 2035 Comprehensive Plan establishes future land use designations to guide growth within the City of Seattle and includes goals and policies that guide general development in the City (City of Seattle 2016a). The Seattle Arena Renovation Project is located at Seattle Center in Uptown. The Comprehensive Plan designates Uptown as 1 of 6 urban centers, and is 1 of the 4 contiguous urban centers referred to as Center City. Urban centers have the highest density neighborhoods in the city and are regional centers that provide a diverse mix of uses, housing, and employment opportunities. Seattle Center is a regional destination that provides a diverse mix of uses and employment opportunities. Accordingly, Uptown is a key component in the City's housing and job growth strategy.

Table 3-5. Seattle 2035 Comprehensive Plan Relevant Goals and Policies

Goal/Policy No.	Relevant Land Use Goals and Policies
LU G14	Maintain the city's cultural identity and heritage.
ED 1.4	Enrich the vibrancy of neighborhood business districts through the integration of design, public art, public space, historic preservation, small locally owned businesses, and cultural spaces and programming.
P G1	Provide a variety of outdoor and indoor spaces throughout the city for all people to play, learn, contemplate, and build community.
P 1.3	Provide urban trails, green streets, and boulevards in public rights-of-way as recreation and transportation options and as ways to connect open spaces and parks to each other, to urban centers and villages, and to the regional open space system.
P G2	Continue to provide opportunities for all people across Seattle to participate in a variety of recreational activities.
P 4.3	Recognize that visitors to major regional attractions can impact the neighborhoods surrounding those facilities, and look for ways to limit those impacts, including through enhanced walking, biking, and transit connections.

The Seattle 2035 Comprehensive Plan states that growth in Uptown should be planned in a way that improves pedestrian access and safety, creates more ground-level open space, increases the supply of affordable housing, improves the connection between the neighborhood and Seattle Center, preserves historic buildings and architectural styles, and leverages a multi-modal transportation system (City of Seattle, 2016a). The future land use for the entire land use study area is commercial/mixed use. Table 3-5 lists the Seattle 2035 Comprehensive Plan goals and policies relevant to the No Action Alternative and Alternatives 1 and 2 for the Seattle Arena Renovation Project.

Discussion: Alternatives 1 and 2 generally support the goals and policies stated above because the project preserves the existing Landmark-designated KeyArena building, which maintains the city's cultural identity and heritage as stated in LU G14. The project supports the ED1.4, P G1, P 1.3, P G2, and P 4.3 goals and policies through the project design that supports pedestrian walkways, plazas, gathering spaces, and support for recreational opportunities. The project also includes coordination with transportation planning efforts and investments. These project elements may be included as part of the project proposal and/or through a Community Benefits Agreement, Community Outreach Program, or similar mechanism agreed upon between the City and OVG.

3.7.2 Consistency with the Seattle 2035 Comprehensive Plan Queen Anne (Uptown) Neighborhood Element

Summary: The Queen Anne (Uptown) Neighborhood Element is a subset of the Seattle 2035 Comprehensive Plan. Table 3-6 lists the Seattle 2035 Comprehensive Plan Queen Anne (Uptown) Neighborhood Element goals and policies relevant to the No Action Alternative and Alternatives 1 and 2 for the Seattle Arena Renovation Project.

Table 3-6. Seattle 2035 Comprehensive Plan Queen Anne (Uptown) Relevant Goals and Policies

Goal No.	Queen Anne (Uptown) Element Land Use Goals and Policies
QA-G3	The Urban Center is a vital residential community as well as a viable and attractive commercial/ employment center and mixed-use neighborhood that enjoys a strong relationship with Seattle Center.
QA-G7	Queen Anne recognizes the impacts that traffic congestion may have on the community's quality of life and strives to address traffic and transportation issues while improving the efficiency of the local and regional transportation system.
QA-P1	Seek to create and maintain attractive pedestrian-oriented streetscapes and enhance Queen Anne's community character with open space, street trees, and other vegetation.
QA-P15	Seek ways to ensure that Seattle Center remains a vibrant and valuable community resource and a premier regional amenity.

Discussion: Many of the Queen Anne (Uptown) Neighborhood Element goals and policies listed in Table 3-6 directly address the interaction between the neighborhood and Seattle Center and the importance of maintaining a positive relationship, which supports the goals of the neighborhood as well as those of Seattle Center.

The No Action Alternative would maintain current conditions and would not be inconsistent with the goals and policies for Uptown.

Alternatives 1 and 2 would not change land uses, but both action alternatives would provide project elements that result in moving forward or working toward goals listed in Table 3-6.

Both Alternatives 1 and 2 are consistent with QA-G3 because both propose to maintain a strong relationship between the vitality of the neighborhood and Seattle Center by renovating KeyArena to attract major league sports back to the area. This, in turn, would support commercial/employment center goals.

Policy QC-G7 recognizes challenges with existing traffic congestion but does not address or contemplate the return of major sports events as expected under Alternatives 1 and 2. As noted in Chapter 4, *Transportation,* transportation impacts from this project could be significant even with a Transportation Management Program (TMP). Consistent with policy QC-G7, the City, OVG, and Seattle Center would continue to work with the community to improve efficiency in the local and regional transportation system.

Both Alternatives 1 and 2 are consistent with QA-P1 because the final design of the project site includes open space pedestrian plazas with landscaping to the south of the arena. The streetscapes and landscapes in both Alternative 1 and 2 are designed to enhance transitions between Seattle Center and Uptown, and the project would preserve and enhance existing park and open spaces.

Depending on the perspective, some may view Alternatives 1 and 2 as a benefit to the City and Uptown and adjacent neighborhoods, while some may see the project as an inconvenience and a contributor to congestion in Uptown.

Based on a review of the Comprehensive Plan goals and policies above and the recognition that the City may negotiate additional project elements that would help meet the goals and policies, Alternatives 1 and 2 are consistent with the Seattle 2035 Comprehensive Plan and Queen Anne (Uptown) Neighborhood Element.

3.7.3 Consistency with the Uptown Rezone Plan Ordinance and Land Use Code (2017)

Summary: The Uptown Rezone amended SMC 23.30.10 to provide for rezoning in Uptown, which includes the entirety of the land use study area. The Uptown Rezone Plan, "[…] seeks to advance the principles set out in the Uptown Urban Design Framework, which are the result of a multi-year community planning process" (City of Seattle, 2017). The rezone and companion changes to development standards were an outgrowth of a neighborhood-wide urban design framework (City of Seattle, 2016b). Zoning changes focused on creating a more walkable, livable, and dense Uptown. Regulatory requirements built into the new SM-UP zone (SMC 23.48.002) would apply to Uptown and would apply to the proposed Seattle Arena Renovation Project.

Discussion: The No Action Alternative presents no change from existing conditions and therefore would not be subject to the Uptown Rezone Plan Ordinance and Land Use Code. Both Alternatives 1 and 2 are generally consistent with the set of regulations in the ordinance. Compliance with Land Use Code standards, including relevant sections of SMC 23.48, would be determined through zoning review of the building plans for the project. OVG would make an affordable housing impact mitigation payment to the City for the increase in arena square footage, as required by the City under both Alternatives 1 and 2.

KeyArena is a unique structure and use that is unlike the general type of structures and uses that are contemplated when zoning standards are adopted for an area in the city, such as conventional residential or commercial buildings. Accordingly, the project would not conform with all general zoning development standards. Alternative 1 would require variances for curb cuts, signage, and night-time construction. The variance process and City Council Land Use Action process (SMC 23.76) are designed to provide flexibility in development standards when a project is otherwise consistent with the spirit and purpose of the Land Use Code. The proposed variances to Title 23 are summarized in Table 3-7. A variance would also be requested for night-time construction work under Title 25, as noted above.

Alternative 2 as proposed would comply with all Land Use Code use and development standards except for curb cuts.

Consistency with Land Use Code

The project is an allowable use in the SM zone and would comply with most applicable use and development standards. The No Action Alternative would not change any uses or structures; therefore, a Land Use Code analysis is not required. Table 3-7 provides an analysis of the Land Use Code sections that Alternative 1 would not comply with. These aspects of the project may be allowed through variance approval or City Council Land Use Action pursuant to SMC 23.76. Additional information on variances for signs (SMC 23.55) for the project are found in Chapter 9, *Visual* and in Appendix G, Table G-1.

Alternative 2 as proposed is intended to comply with all land use code use and development standards except for curb cuts.

Table 3-7. Land Use Code Nonconformities for Alternative 1

Section	Summary of Code	Proposed Variances
SMC 23.54.030.F Curb Cuts	Limits the number and width of curb cuts based on use, zone, and street classification. Curb cuts for non-residential uses are generally limited to 25 feet in width to accommodate 2-way traffic. A width of up to 30 feet may be allowed if necessary for safe access, or if truck and auto access are combined.	The proposed width of the curb cut on Thomas St serving the 450-space underground garage would exceed 30 feet to accommodate 3 travel lanes. The curb cut on 1st Ave N for the driveway entrance to the access tunnel to the underground loading dock and the new location for the driveway entrance to the 1st Ave N Garage on John St would also require variances.
SMC 23.55 Signs	The code limits the type, number, size, location, and other aspects of signs.	Variances are sought from restrictions on sign type, number, size, location, video display, brightness, commercial content, and other aspects of SMC 23.55. See Appendix G, Table G-1 for a full list of variances proposed.

3.7.4 Consistency with the Seattle Center Century 21 Master Plan (2008)

Summary: The Seattle Center Century 21 Master Plan as adopted by the City articulates a vision for the future of Seattle Center over a 20-year period (Seattle Center, 2008). KeyArena is a major revenue generator supporting Seattle Center's operational expenses. The Century 21 Master Plan goals for the KeyArena Zone (pages 28 and 29) include the following:

- KeyArena is a major revenue generator supporting Seattle Center.
- KeyArena will continue to be the premiere venue in Seattle for touring concerts and family shows.
- KeyArena maintains its competitive edge among similar local venues and expands into new lines of business in the future.
- The area encircling KeyArena is ripe for public/private partnerships.

Discussion: Under the No Action Alternative, KeyArena would continue to host programming unless a different project is proposed in the future.

Both Alternatives 1 and 2 would fulfill many of the goals in the Seattle Center Century 21 Master Plan, including making improvements to the existing KeyArena building to enhance the building's performance systems, providing opportunities that could generate ongoing revenues for Seattle Center, and maintaining a competitive edge among similar venues. Alternatives 1 and 2 are consistent with the Seattle Center Century 21 Master Plan.

4.0 TRANSPORTATION

This chapter describes the potential effect of a renovation of KeyArena on the transportation system. A variety of travel modes are addressed, including auto, freight, bicycles, pedestrians, and transit. Parking, curb space management, and safety are also analyzed. The chapter begins with the *Methods* section, which describes the analysis methodologies and data relied upon in the study. It then presents the *Regulatory Context*, which outlines various regulations and guidelines that govern traffic operations and construction activities. Next, the *Affected Environment* section is presented, which describes the transportation system as it currently functions. The *Potential Impacts* section describes conditions under a No Action Alternative and 2 renovation alternatives for the years 2020 and 2035. The *Avoidance, Minimization, and Mitigation Measures* section describes approaches to mitigate the potential impacts of the 2 arena renovation alternatives, and the final section identifies impacts that are likely to be significant and unavoidable.

Key Findings for Transportation

Traffic conditions in the study area are expected to worsen with or without the arena renovation since a substantial amount of new development is approved and forecasted in the area.

In the near-term, the project would worsen traffic conditions, increase the demand for parking, and also cause localized impacts to non-auto modes.

A variety of mitigation measures, if implemented, would improve the efficiency of the transportation network to accommodate project trips. Measures proposed include implementation of an Event Transportation Management Program (TMP), a parking reservation system, and construction of physical improvements near the project site.

4.1 METHODS

The study area selected for the transportation impact analysis includes the intersections and corridors most likely to be affected by project traffic, covering the area from Queen Anne Ave N to Interstate 5 (I-5) and Roy St to roughly half a mile south of Denny Way (Figure 4-1). The pedestrian, bicycle, transit, and parking analysis is more narrowly focused on the area surrounding the project site.

Data sources for the analysis include the following:

- SDOT – data on signal timings; parking supply and occupancy; freight, pedestrian, and bicycle networks; and collisions. Planned capital projects from the City's modal plans (Pedestrian, Bicycle, Freight, and Transit Master Plans) and project websites (City of Seattle 2017a, 2017b, 2016a, and 2016c, respectively).
- SDCI – current and planned land use development data (SDCI, 2016a, 2016b, 2017).
- Seattle Center – event attendance, Monorail ridership.
- King County Metro – route maps, frequencies and capacities, transit ridership.
- Washington State Department of Transportation (WSDOT) – planned improvements near the SR 99 North Tunnel Portal; timing of improvements.
- Traffic, pedestrian, and bicycle volume; corridor travel time; parking supply and occupancy data collected for this analysis.

- Puget Sound Regional Council (PSRC) – project travel demand model based on PSRC's regional travel demand model (PSRC, 2017; Fehr & Peers, 2018).

This chapter includes a multimodal analysis of project effects on the roadway, transit, bicycle, and pedestrian networks, as well as an evaluation of effects on freight and goods movement, ferry service, roadway safety, and truck staging and loading. Traffic operations (vehicles, buses, pedestrians in crosswalks, and bicycles crossing streets) were evaluated using micro-simulation software for transportation operations.

The simulation was conducted using the Vissim and Synchro/SimTraffic software packages, which use inputs that include current and future traffic/pedestrian/bicycle volumes, transit operations, and traffic signal timings (Trafficware, 2014; PTV Group, 2017). These models were calibrated to reflect existing conditions and then applied to the future year alternatives. Various data can be extracted from micro-simulation models including average delay experienced by vehicles at intersections, corridor travel times, bus travel times, interactions between pedestrians/bicycles at intersections, and queue lengths. More details are found in Appendix C, Tech Memo 4, Existing Conditions. In addition, transit capacity, pedestrian capacity, bicycle facilities, and on-street and off-street parking occupancy under existing and future conditions were evaluated.

The transportation analysis differs from the other chapters in this EIS in 2 important ways:

- **Cumulative Condition:** The transportation analysis is performed for years 2020 and 2035. Year 2020 is assumed to be the year of opening of the arena, and year 2035 provides a longer term horizon year that is consistent with the City's land use and transportation plans, as well as regional plans including LINK light rail expansion. Both analysis years represent a cumulative condition that includes background traffic growth and other planned transportation improvements that would occur regardless of the proposed arena renovation project. This background growth is included in all alternatives—the only difference between the No Action Alternative and the action alternatives is the proposed project. Therefore, the difference between the No Action Alternative and Alternatives 1 and 2 indicates the direct impacts of the proposed project.
- **Multiple Scenarios:** The project is on the Seattle Center campus, which is home to many attractions and venues with widely varying degrees of activity over the course of a year. To reflect the spectrum of conditions in the study area, 2 scenarios are considered for each project alternative: a day with Average Seattle Center Attendance (based on the 50th percentile of Seattle Center attendance, i.e., attendance is below this level half of the time and above this level half of the time), and a day with Above-Average Seattle Center Attendance (based on the 90th percentile of Seattle Center attendance; i.e., 9 out of 10 days have attendance below this level).

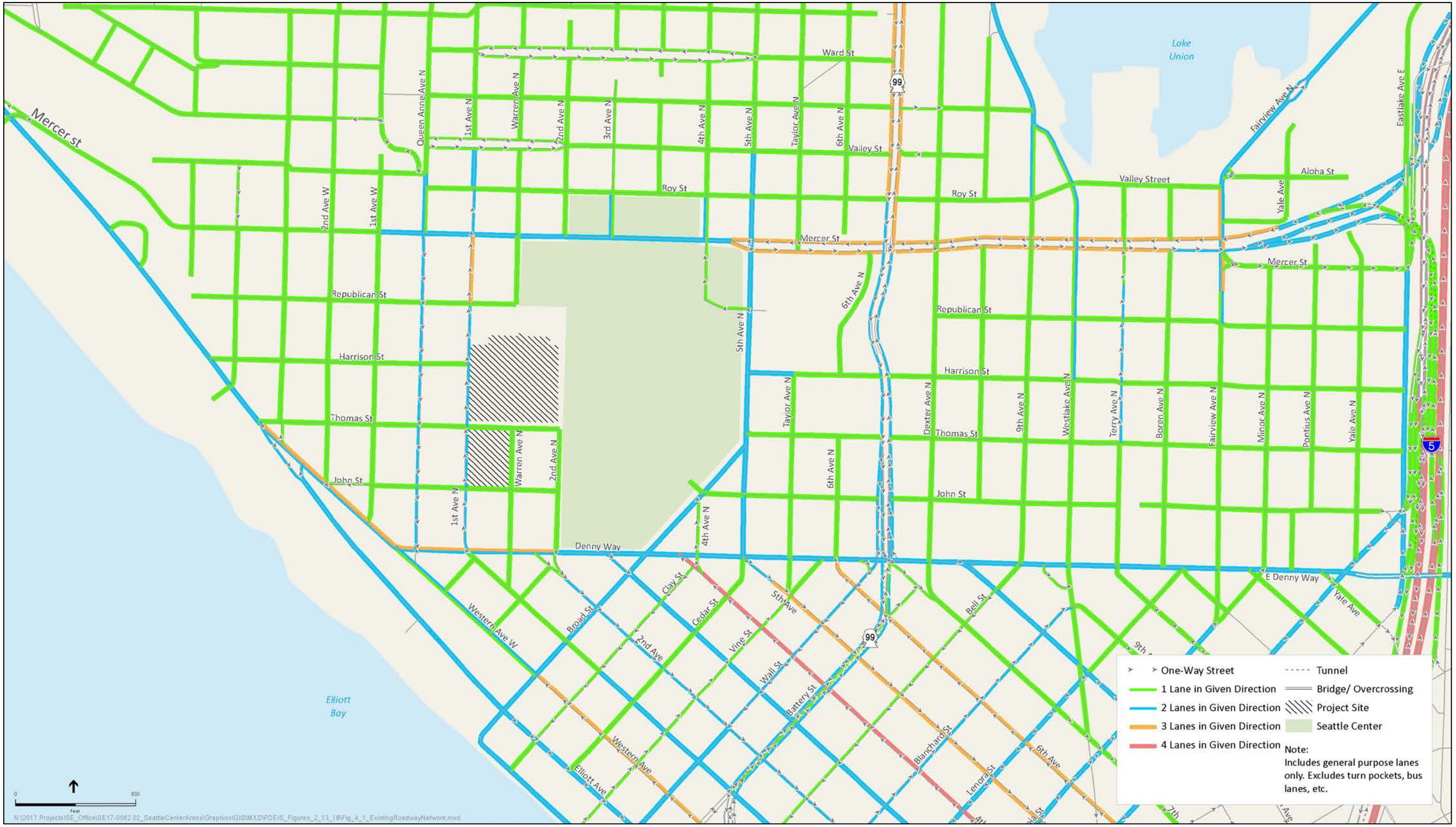


Figure 4-1. Existing Roadway Network

4.2 REGULATORY CONTEXT

The project must comply with existing regulations and guidelines. Those that govern traffic operations and construction activities within the transportation impact analysis study area are listed in Table 4-1.

Table 4-1. Regulations and Guidelines Applicable in the Study Area

Document or Regulation Name	Description
Street Use Permits (SMC 15.04)	Construction activities that affect the city's transportation system are subject to SDOT's street use and construction use regulations. The City works with developers/contractors to ensure adequate use of the right-of-way for transportation purposes during construction.
Memorandum of Agreement (MOA) for Event Curbside Management (SDOT and Seattle Center, 2011)	Agreement between SDOT and Seattle Center regarding procedures to reserve right-of-way curb space for loading, unloading, and staging of vehicles for events at Seattle Center (including KeyArena).
Seattle Streets Illustrated, Right-of-Way Improvements Manual (City of Seattle, 2018)	Provides design guidance, standards, and processes on how to design, build, and manage within the right-of-way.
Manual of Uniform Traffic Control Devices (MUTCD) (2009 with revisions incorporated 2012) (Federal Highway Administration, 2012)	Defines standards used by agencies nationwide to install and maintain traffic control devices on public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is a compilation of national standards for all traffic control devices, including road markings, highway signs, and traffic signals. The MUTCD includes standards for signs, flagging, and barricades in temporary construction work zones.

4.3 AFFECTED ENVIRONMENT

4.3.1 Study Area

The project site is on the west side of Seattle Center in the Uptown Urban Center, which is bordered by Belltown to the south, South Lake Union to the east, Queen Anne to the north, and Elliott Bay to the west. Transportation conditions in the study area reflect the area's dense mixed-use urban setting with a variety of available travel modes and congested conditions during peak hours. The transportation impact analysis study area varies depending on mode, but generally stretches east to I-5, west to Queen Anne Ave N, north to Roy St, and south to roughly a half-mile south of Denny Way. Because the study area encompasses key routes used to access residential areas such as Uptown and Queen Anne, project-related effects to travelers originating from or destined to these areas are considered in the analysis.

4.3.2 Traffic Operations

Figure 4-1 displays the existing roadway network in the study area. Regional access to the project site is provided by I-5 and SR 99. The key surface streets that provide access to the project site are Mercer St,

Denny Way, 2nd Ave, 4th Ave, and the 1st Ave N/Queen Anne Ave N couplet. Both Mercer St and Denny Way are major east-west arterials connecting the project site to I-5 to the east and Western Ave and Elliott Ave to the west. Both corridors feature closely spaced signalized intersections. Denny Way and Roy St also provide access from southbound SR 99.

Between Denny Way and Mercer St, 1st Ave N and Queen Anne Ave N operate as a 1-way couplet with 1st Ave N consisting of 2 northbound lanes (a third lane is added approaching Mercer St) and Queen Anne Ave N consisting of 2 southbound lanes. These streets facilitate travel within Uptown and are also prominent bus routes. South of Denny Way, the street grid shifts to a northwest/southeast orientation. Some streets allow 2-way travel while others are 1-way only.

The City designates Denny Way, Mercer St, and SR 99 as major truck streets and Broad St and 5th Ave N as minor truck streets (SDOT, 2018). Major truck streets serve as primary routes for movement of goods and services; they accommodate significant freight movement through the City, and to and from major freight traffic generators. Minor truck streets provide secondary connections to major truck streets, tend to carry lower volumes of trucks, and may have more restrictions in terms of oversized vehicles.

Construction is underway to replace the Battery St Tunnel and the elevated Alaskan Way Viaduct with a new tolled tunnel with access points north and south of Downtown. New street connections across the existing SR 99 will be constructed east of the project site. These improvements will be complete by 2020, and are assumed in the Opening Day (2020) conditions analysis. See Appendix C, Tech Memo 3, Year 2020 and 2035 Background Transportation Network for full details of the transportation network assumptions.

Figure 4-2 displays the study area including the 58 existing intersections chosen for analysis for each of the following 3 “peak hour” analysis periods:

- **Weekday from 5:30 to 6:30 PM (Weekday Pre-Event Peak Hour)** – Represents the pre-event peak hour for a future scenario that evaluates a sold-out 18,350-person NBA Basketball Game that starts at 7 PM. NHL hockey games would have slightly less seating capacity than a basketball game, but similar travel characteristics based on observations by Fehr & Peers at other urban arenas that host NHL hockey including facilities in San Jose, California and Washington, DC.
- **Weekday from 9:30 to 10:30 PM (Weekday Post-Event Peak Hour)** – Represents the post-event peak hour for a future scenario that evaluates a sold-out 18,350-person NBA Basketball Game that starts at 7 PM. NHL hockey games would have slightly less seating capacity than a basketball game, but similar travel characteristics.
- **Saturday from 6:00 to 7:00 PM (Saturday Pre-Event Peak Hour)** – Represents the pre-event peak hour for a future scenario that evaluates a sold-out 19,125-person concert that starts at 7:30 PM. Post-event traffic on Saturday is not analyzed because the results are expected to be similar to the weekday post-event condition.

These 3 analysis periods were selected based on traffic volume counts in the study area and event arrival patterns at KeyArena and other comparable venues; additional information is found in Appendix C, Tech Memo 1, Selection of Time Periods.

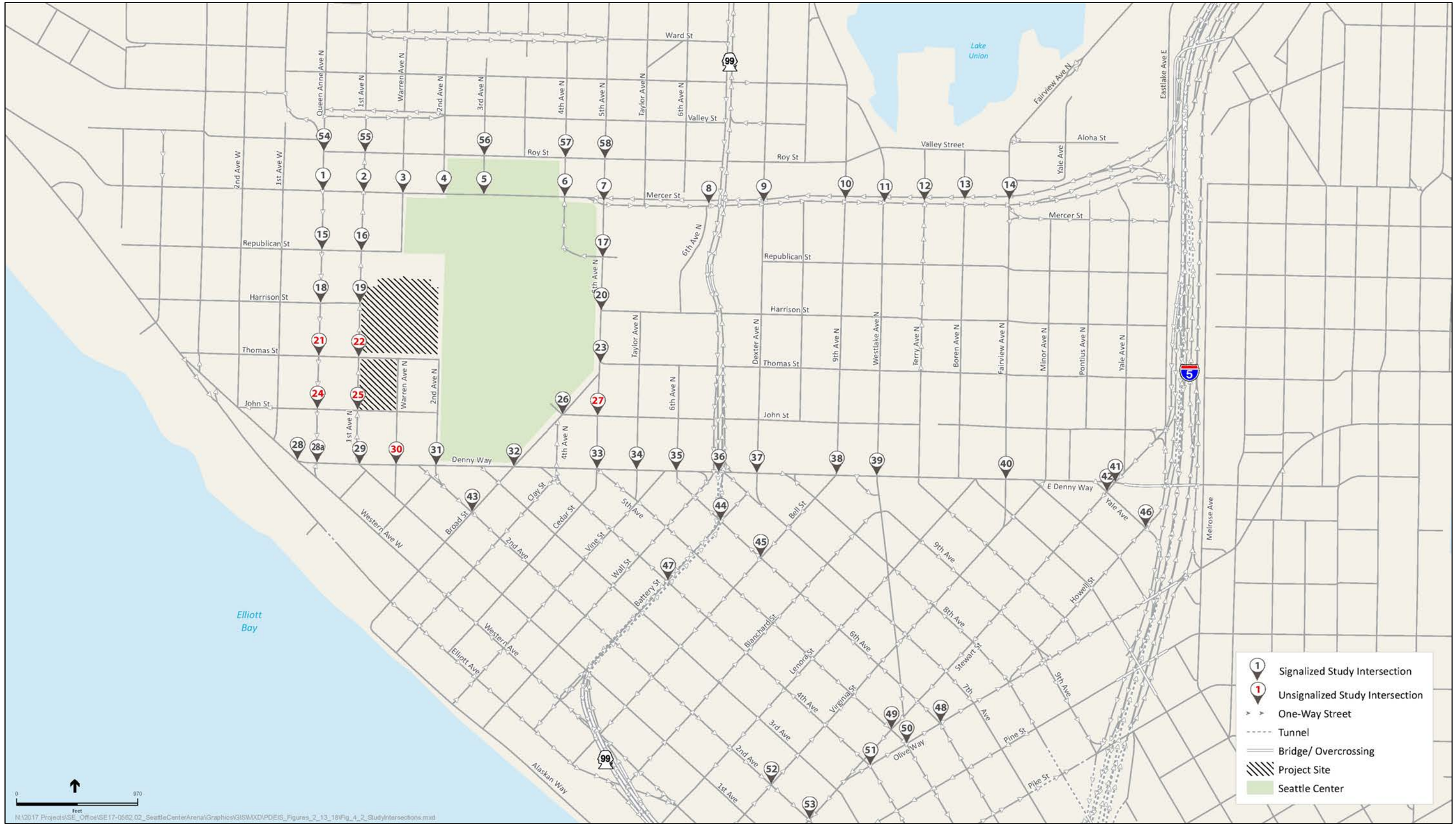


Figure 4-2. Study Intersections

During the pre-event peak hour, substantial recurring congestion is present in both directions of I-5 and SR 99. Eastbound traffic on Mercer St queues back to 5th Ave N due to congestion on I-5 and high volumes of vehicles joining the corridor at key cross streets. Similar conditions exist in the eastbound direction of Denny Way. The off-ramp from northbound I-5 to Mercer St can also be busy in the weekday pre-event peak hour because of the sharp curve and limited sight distance in the tunnel under the southbound lanes. While busy, no other off-ramps in the study area experience congestion in the weekday pre-event peak hour or the other study time periods.

Intersection operations were measured using the intersection Level of Service (LOS) scale that ranges from LOS A (which represents minimal delay) to LOS F (which represents high delay and severe congestion). LOS is defined by the *2010 Highway Capacity Manual – HCM* (Transportation Research Board, 2010). Table 4-2 displays the range of delays corresponding to each LOS grade. For this analysis, the average delay and LOS at signalized intersections are the weighted average of all vehicles passing through a given intersection (i.e., on all approaches of the intersection). For side-street stop sign-controlled intersections, the average delay and LOS are reported for the worst minor street movement. For all-way stop intersections, the average delay and LOS are reported for the entire intersection. Average delay values are rounded to the nearest integer.

Table 4-2. Level of Service (LOS) and Delay Thresholds for Signalized and Unsignalized Intersections

LOS	Signalized Intersections Delay per Vehicle (seconds)	Unsignalized Intersections Delay per Vehicle (seconds)
A	≤ 10	≤ 10
B	> 10 to 20	> 10 to 15
C	> 20 to 35	> 15 to 25
D	> 35 to 55	> 25 to 35
E	> 55 to 80	> 35 to 50
F	> 80	> 50

Source: Highway Capacity Manual (Transportation Research Board, 2010).

All study intersections along and north of Denny Way were analyzed using the Vissim micro-simulation model. This software program considers numerous roadway conditions (e.g., volumes, signal timings, lane utilization, pedestrian flows, transit vehicles, blockages caused by pick-up/drop-off activity, etc.), all of which influence traffic operations. The model underwent a thorough validation process to accurately replicate existing conditions such as the back of the vehicle queue on eastbound Mercer St, flow rates onto I-5, and average travel times/speeds. Study intersections south of Denny Way were analyzed using Synchro/SimTraffic due to their specific conditions (i.e., level of traffic, congestion, pre-timed/ coordinated conditions, etc.). Additional detail is found in Appendix C, Tech Memo 4, Existing Conditions.

Table 4-3 summarizes the existing average delay and LOS by location for the 3 analysis periods. Traffic counts were collected in September and October 2017 on dates identified by Seattle Center and SDOT staff as representative of typical activity at Seattle Center. These dates did not include an event at

KeyArena so the LOS results presented here represent conditions without arena activity. Additional detail is found in Appendix C, Tech Memo 4, Existing Conditions.

Table 4-3. Intersection Level of Service – Existing Conditions

Corridor / Subarea	Description	Number of Intersections	Level of Service	Number of Intersections		
				Weekday Pre-Event 5:30–6:30 PM	Weekday Post-Event 9:30–10:30 PM	Saturday Pre-Event 6:00–7:00 PM
Mercer St Corridor	From Queen Anne Ave N to Fairview Ave N (Inclusive)	14	D or better	9	14	14
			E	3	0	0
			F	2	0	0
Queen Anne Ave N and 1st Ave N Couplet	Between (but not including) Denny Way and Mercer St	8	D or better	8	8	8
			E	0	0	0
			F	0	0	0
5th Ave N and Broad St	Between (not including) Denny Way and Mercer St)	5	D or better	5	5	5
			E	0	0	0
			F	0	0	0
Denny Way Corridor	From Western Ave W to Stewart St (Inclusive)	15	D or better	11	14	14
			E	1	1	1
			F	3	0	0
Other	Various [1]	16	D or better	14	16	16
			E	2	0	0
			F	0	0	0
Total		58	D or better	47	57	57
			E	6	1	1
			F	5	0	0

[1] Includes intersections in Belltown, Downtown, along Roy St, and near I-5 (on Yale Ave and Howell St).

Source: Prepared by Fehr & Peers, 2018, based on data collected in September and October 2017. Results from VISSIM and SimTraffic analyzed using the methods defined in the Highway Capacity Manual (Transportation Research Board, 2010).

Figure 4-3 shows the intersections operating below the City's LOS threshold (LOS E or F for signalized intersections, and LOS F for unsignalized intersections). Because overall intersection delay is averaged among all approaches for signalized intersections (as shown in Table 4-3), delay results may not align with a driver's experience driving the corridor since they are traveling on a single approach. Figure 4-4 shows the directional LOS along eastbound and westbound Denny Way and Mercer St for weekday pre-event conditions.

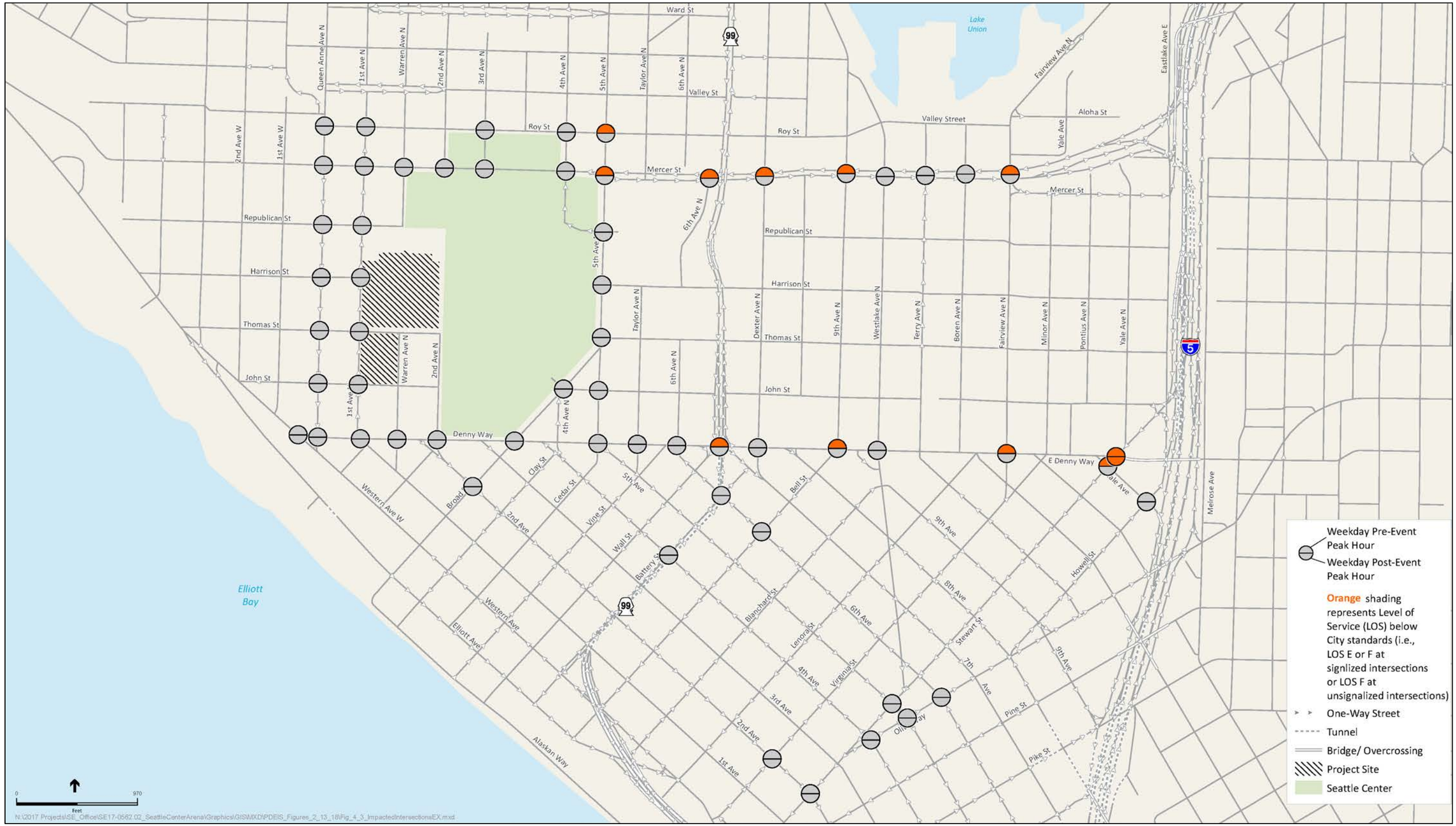


Figure 4-3. Intersection Level of Service – Existing Weekday Pre-Event and Post-Event Peak Hour Conditions

Figure 4-4. Directional Level of Service and Travel Time on East/West Roadways – Existing Weekday Pre-Event Peak Hour (5:30–6:30 PM) Conditions

As shown, the eastbound approaches are routinely in the LOS F range, while westbound approaches are typically at LOS C or better, which represents relatively uncongested travel toward Seattle Center and KeyArena. This occurs as a result of traffic congestion on I-5, which limits of the flow of traffic onto the freeway from the eastbound travel directions on Mercer St and Denny Way. Some blocks reflect better directional LOS than may be expected with the congested conditions; this is because the delay is spread among multiple closely spaced signals.

The congested conditions on eastbound Mercer St and Denny Way between 5th Ave N and I-5 result in substantial queuing on some side-street approaches to those corridors. Observations revealed substantial queues in the southbound left-turn and northbound right-turn lanes along Mercer St at Dexter Ave N, 9th Ave N, Westlake Ave N, Terry Ave N, Boren Ave, and Fairview Ave N. Substantial queues were also observed on side-streets approaching Denny Way including Aurora Ave N, Battery St, Westlake Ave N, Fairview Ave N, and on all approaches at the closely spaced Denny Way/Stewart St and Yale Ave/Stewart Ave intersections.

The LOS results for intersections along the 1st Ave N and Queen Anne Ave N couplet show less congestion than the intersections farther to the east. This is principally because the queuing that stems from I-5 congestion generally does not reach that far west into Uptown.

Collision Analysis

Collision history data provided by SDOT at the study intersections is summarized in Table 4-4. The total number of collisions and the annual average collisions from October 2014 through October 2017 are shown. The table lists collisions that were injury-related, those involving bicyclists or pedestrians, and the most common collision type. None of the reported collisions caused a fatality.

The City designates intersections as “high collision locations” if there are an average of 10 or more reported collisions per year for signalized intersections or an average of 5 or more reported collisions per year for unsignalized intersections. Intersections with this designation are targeted for future safety improvements to reduce the frequency of collisions.

Based on the reported collision data, none of the study intersections reached the collision frequency threshold to be considered a high collision location. The Mercer St/Fairview Ave N, 5th Ave/Olive Way, Mercer St/Queen Anne Ave N, Denny Way/Stewart St, and Denny Way/Dexter Ave N signalized intersections each averaged 6 or 7 collisions over the 3-year period. The highest number of collisions involving bicyclists or pedestrians occurred at the Mercer St/Queen Anne Ave and Denny Way/Westlake Ave N intersections.

Table 4-4. Intersection Collision History

ID	Intersection [1]	Number of Collisions				Most Common Collision Type [2]
		Average Per Year	3- Year Totals			
			Total Collisions	Injury Collisions	Involving Pedestrians or Bicyclists	
1	Mercer St/Queen Anne Ave N	6	19	9	7	Pedestrian
2	Mercer St/1st Ave N	2	5	4	2	Pedestrian
3	Mercer St/Warren Ave N	2	7	2	1	Left Turn
4	Mercer St/2nd Ave N	2	5	3	1	NA
5	Mercer St/3rd Ave N	1	4	1	0	Rear Ended
6	Mercer St/4th Ave N	2	7	4	1	Angles
7	Mercer St/5th Ave N	3	8	3	2	Sideswipe
8	Mercer St/6th Ave N	None Reported				
9	Mercer St/Dexter Ave N	1	3	0	0	NA
10	Mercer St/9th Ave N	4	11	4	3	Bicycles, Angles
11	Mercer St/Westlake Ave N	3	9	1	0	Angles
12	Mercer St/Terry Ave N	2	7	4	3	Pedestrian
13	Mercer St/Boren Ave N	1	2	1	1	NA
14	Mercer St/Fairview Ave N	7	22	7	2	Left Turn
15	Queen Anne Ave N/Republican St	1	3	1	1	NA
16	1st Ave N/Republican St	1	3	1	1	NA
17	5th Ave N/Republican St	None Reported				
18	Queen Anne Ave N/Harrison St	1	3	0	0	Left Turn
19	1st Ave N/Harrison St	2	6	0	1	Left Turn
20	5th Ave N/Harrison St	0	1	1	0	Left Turn
21	Queen Anne Ave N/Thomas St (U)	1	2	1	0	NA
22	1st Ave N/Thomas St (U)	3	9	1	1	Angles
23	5th Ave N/Thomas St/Broad St	1	3	2	1	Other
24	Queen Anne Ave N/John St (U)	1	4	1	0	Angles
25	1st Ave N/John St (U)	1	3	2	1	NA
26	Broad St/John St	None Reported				
27	5th Ave N/John St (U)	1	4	1	0	Angles, Left Turn
28	Denny Way/Queen Anne Ave N/Western Ave	2	6	2	1	Sideswipe
29	Denny Way/1st Ave N	2	7	0	1	Sideswipe
30	Denny Way/Warren Ave N (U)	2	6	3	0	Angles, Left Turn
31	Denny Way/2nd Ave N[3]	2	5	2	0	Angles
32	Denny Way/Broad St	1	2	1	0	Angles
33	Denny Way/5th Ave N	4	13	4	2	Angles
34	Denny Way/Taylor Ave N	0	1	1	1	Angles
35	Denny Way/6th Ave N	1	3	0	0	NA
36	Denny Way/Aurora Ave N/7th Ave	4	12	2	1	Angles

ID	Intersection [1]	Number of Collisions				Most Common Collision Type [2]
		Average Per Year	3- Year Totals			
			Total Collisions	Injury Collisions	Involving Pedestrians or Bicyclists	
37	Denny Way/Dexter Ave N	6	17	5	4	Left Turn
38	Denny Way/Bell St/9th Ave N	2	6	4	0	Angles, Right Turn
39	Denny Way/Westlake Ave N	4	12	8	6	Pedestrian
40	Denny Way/Fairview Ave N	4	12	2	0	Angles, Left Turn
41	Denny Way/Stewart St	6	17	7	5	Left Turn
42	Yale Ave/Stewart St	3	10	3	1	Left Turn
43	Broad St/2nd Ave	3	10	7	1	Angles
44	6th Ave/Battery St	None Reported				
45	6th Ave/Bell St	0	1	1	1	Pedestrian
46	Yale Ave/Howell St/I-5 SB on-ramp	1	4	1	1	NA
47	4th Ave/Battery St	4	12	4	0	Angles
48	6th Ave/Olive Way	3	9	3	1	Left Turn, Sideswipe
49	5th Ave/Stewart St	3	9	2	0	Angles
50	5th Ave/Olive Way	7	21	5	1	Left Turn
51	4th Ave/Olive Way	1	4	1	1	Sideswipe
52	2nd Ave/Virginia St	3	10	6	1	Angles
53	2nd Ave/Stewart St	4	11	2	2	Sideswipe
54	Queen Anne Ave N/Roy St	1	3	0	0	NA
55	1st Ave N/Roy St	None Reported				
56	3rd Ave N/Roy St	1	3	3	3	Bicycles
57	4th Ave N/Roy St	0	1	0	0	Left Turn
58	5th Ave N/Roy St	1	2	1	1	NA

1. Intersections 21, 22, 24, 25, 27, and 30 are unsignalized (U).

2. "Angles" are multi-vehicle collisions in which the vehicles collide at an angle (most often head-on). "Pedestrian" are when a motor vehicle strikes a pedestrian. "NA" means no single common collision type.

3. The Denny Way/2nd Ave N intersection was reconfigured in late 2017 to convert one of the southbound receiving lanes into a bicycle lane.

Source: Prepared by Fehr & Peers, 2018 based on data provided by SDOT.

Curb Space Management

Figure 4-5 displays a block-by-block inventory of the currently permitted usage of curb space along the frontage of Seattle Center. This includes both sides of the street along 1st Ave N, Warren Ave N, Mercer St, 4th Ave N, Republican St, 5th Ave N, Broad St, Denny Way, 2nd Ave N, and Thomas St. The figure shows the permitted usage of curb space for a weekday evening; Saturday evening restrictions are generally the same as weekdays with minor exceptions. Several signs along 1st Ave N and Thomas St have curb space signage that expire or transition at 6:00 PM, but Figure 4-5 is generally representative of curb space restrictions starting at the 5:30 PM pre-event analysis period. This figure shows that a variety of different curb space uses are designated including:

- Loading/unloading zones
- King County Metro (Metro) bus stops and layover areas
- Passenger loading/unloading only
- Charter bus parking
- School bus parking
- Designated disabled parking
- 2-hour metered parking (expires at 6:00 PM)
- 4-hour metered parking (expires at 8:00 PM)
- Taxi zones
- Restricted Parking Zone (RPZ) parking
- Unpaid, unrestricted parking
- Unpaid, time-limited parking

Figure 4-5 indicates that passenger loading/unloading (from private vehicles, ridehailing or Transportation Network Companies [TNCs] such as Uber and Lyft, or taxis) is permitted along portions of 1st Ave N, 2nd Ave N, and Mercer St. Parking is prohibited along the vast majority of 5th Ave N, Broad St, and Denny Way. Time limits and paid parking are not in effect on Sundays.

A Memorandum of Agreement (MOA) between Seattle Center and SDOT describes the process to reserve curb space on specific streets for the purposes of loading, unloading, and staging events at Seattle Center (SDOT and Seattle Center, 2011). The term of the MOA is indefinite unless amended or replaced by agreement of both parties. Curb space reservations occur along a number of streets around Seattle Center including Thomas St, Republican St, Roy St, Warren Ave N, and 2nd Ave N, as shown in Figure 4-5. Bus/truck staging activities have priority over all other uses of the curbs covered by the MOA.

4.3.3 Transit Routes and Operations

The proximity of the project site to the Downtown Seattle core transit network allows for access to a range of local and regional transit services. This section describes the existing transit services within the study area, including fixed route bus, Monorail, streetcar, light rail, and ferry facilities and services.

Fixed Route Bus Service

King County Metro is the primary operator of fixed route bus services in the vicinity of the project site. Figure 4-6 illustrates the existing fixed route bus services within the study area. As shown in Figure 4-6, buses operate north-south along the 1st Ave N / Queen Anne Ave N couplet immediately west of the project site. East-west bus service is present on Denny Way and on Mercer St west of 1st Ave N. Several roadways accommodate north-south bus service through the study area, including Elliott Ave W, 5th Ave N, 3rd Ave, and Aurora Ave N. Table 4-5 summarizes the existing weekday, Saturday, and Sunday frequency and span of service for Metro bus routes in the study area.

Metro and the City are collaborating on the implementation of additional RapidRide lines (RapidRide Lines C, D, and E are already in operation in or near the study area). RapidRide bus routes provide service at least every 10 minutes during the morning and evening peak periods and also provide late

night and early morning service every day of the week. RapidRide buses allow faster boarding than typical buses (through off-board payment and boarding through multiple doors) and often travel along routes with transit priority treatments. By 2020, RapidRide H (Burien–Downtown Seattle) would be in service; Madison Bus Rapid Transit (BRT) is currently scheduled to open in 2021. By 2035, an additional 5 RapidRide lines would be in service (Roosevelt, Rainier, Market, Fremont, and 23rd), several of which would serve South Lake Union and/or Downtown.

Figure 4-7 displays bus services and individual stop locations in the Seattle Center vicinity. Denny Way carries the highest bus volumes in the vicinity, with 71 weekday pre-event peak hour bus trips (eastbound and westbound combined) on the segment between Western Ave and 3rd Ave. The Queen Anne Ave N and 1st Ave N couplet also accommodates high bus volumes, with 32 weekday pre-event peak hour bus trips on each roadway (64 total peak hour trips).

As shown in Figure 4-7, existing bus stops in the vicinity of the project site are located on Queen Anne Ave N, 1st Ave N, 5th Ave N, and Denny Way. Some bus stops have pullouts while others stop in the travel lane. Shelters and benches are provided at many, but not all, locations. Buses along Denny Way often experience congestion. To address this situation, a bus-only queue bypass lane will be implemented in 2018 on eastbound Denny Way between Fairview Ave N and Stewart St. This project is included in the Opening Day (2020) conditions analysis. Refer to Appendix C, Tech Memo 3, Year 2020 and 2035 Background Transportation Network, for details.

Fixed Bus Route Capacity

Fixed bus route capacity was evaluated for all routes with stops within one-quarter mile of the project site. Reserve capacity was calculated based on the existing service levels, vehicle types, and ridership levels. This analysis was conducted for 2 locations along each route: at Seattle Center and at the point on the route with the maximum passenger load. Details are presented in Appendix C, Tech Memo 4, Existing Conditions. Under non-event conditions, all of the Metro routes in the study area have reserve capacity (i.e., room for additional passengers) at Seattle Center and at the route's maximum passenger load point on weekdays during the pre- and post-event analysis periods (King County Metro, 2017). The amount of reserve capacity varies by route and direction, particularly during the pre-event peak hour when bus routes serving evening commuters leaving Downtown have less reserve capacity than those traveling in the opposite direction toward Downtown. During the late evening hours, fewer buses operate and the frequency of trips is lower when compared to the pre-event peak hour. This reduction in frequency corresponds with a decrease in available reserve capacity for outbound bus service leaving the study area during the post-event peak hour. Metro's data reflect the average peak loading during the peak hour. Some buses would be full and pass-up passengers during the peak hour, but Metro data indicate that over the entire peak hour there is reserve capacity on all routes serving the Seattle Center area. See Appendix C, Tech Memo 4, Existing Conditions, for details of existing peak hour trips, total capacity, and reserve ridership capacity by route.

Passenger load is the number of passengers on a bus at a single location or point in time. Accounting for both seated and standing passengers, a **crush load** is defined as the passenger load exceeding either 125% or 150% (depending on bus type) of the seated capacity of the bus.

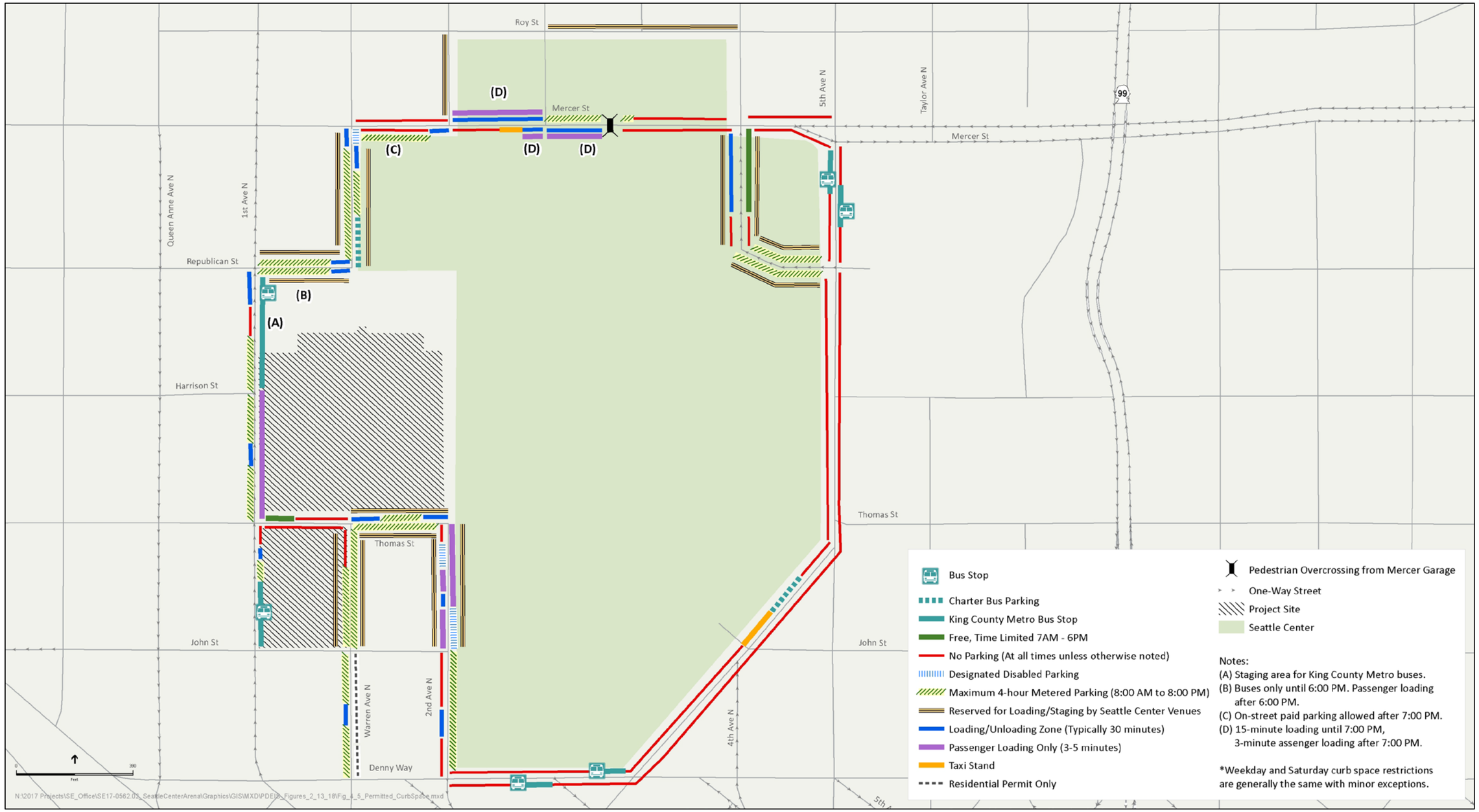


Figure 4-5. Weekday/Saturday Evening Curb Space Permitted Usage

Table 4-5. Fixed Route Bus Services in the Study Area – Existing Conditions

Route	Description	Metro Service Type	Weekday		Saturday		Sunday	
			Frequency (Peak/ Off-Peak)	Span of Service	Frequency (Peak/ Off-Peak)	Span of Service	Frequency (Peak/ Off-Peak)	Span of Service
1	Kinnear to Downtown	Very Frequent	15/20	5 AM–1 AM	20/20	6 AM–1 AM	30/30	5:30 AM–1 AM
2/13	SPU to Downtown to Madrona Park	Very Frequent	10/15	4:30 AM–2 AM	15/15	5 AM–2 AM	15/15	5:30 AM–2 AM
3/4	SPU to Downtown to Judkins Park	Frequent	10/15	4 AM–3:30 AM	15/15	4 AM–3:30 AM	30/30	4 AM–3:30 AM
5	Shoreline CC to Greenwood to Downtown	Very Frequent	12/15	24 hrs	15/15	24 hrs	15/15	24 hrs
8	Mt. Baker TC to Cap. Hill to Seattle Center	Very Frequent	10/12	5 AM– 1 AM	15/15	5:30 AM–1 AM	20/20	6 AM–1 AM
19	West Magnolia to Downtown	Peak	20/--	Peak Only	--	--	--	--
24	West Magnolia to Downtown	Local	15/30	5 AM–1 AM	30/30	6 AM–1 AM	30/30	6 AM–1 AM
29	Ballard to SPU to Downtown	Peak	15/--	Peak Only	--	--	--	--
32	Magnolia to Fremont to University District	Local	15/30	6 AM–1 AM	15/30	6 AM–1:30 AM	30/30	6 AM–1 AM
33	Discovery Park to Downtown	Local	30/30	5 AM–12 AM	30/30	6 AM–11 PM	30/30	6 AM–11 PM
40	Northgate TC to Ballard to Downtown	Very Frequent	8/15	5 AM–2 AM	15/15	6 AM– 2 AM	15/15	6 AM–2 AM
62	Sand Point to Green Lake to Downtown	Peak	10/15	5 AM–2 AM	15/15	6 AM–2 AM	15/15	6 AM–2 AM
63	Northgate TC to Cherry Hill	Peak	20/--	Peak Only	--	--	--	--
70	University District to Eastlake to Downtown	Very Frequent	10/15	24 hrs	15/15	24 hrs	15/15	24 hrs
5X	Shoreline CC to Greenwood to Downtown	Peak	12/--	Peak Only	--	--	--	--
15X	Blue Ridge to Crown Hill to Downtown	Peak	10/--	Peak Only	--	--	--	--
17X	Sunset Hill to Ballard to Downtown	Peak	15/--	Peak Only	--	--	--	--
18X	North Beach to Ballard to Downtown	Peak	15/--	Peak Only	--	--	--	--
26X	Northgate TC to Green Lake to Downtown	Peak	10/30	5 AM–2 AM	30/30	6:30 AM–2 AM	30/30	6:30 AM–2 AM
28X	Broadview/Carkeek Park to Downtown	Peak	10/30	5 AM– 1 AM	30/30	6 AM–1 AM	30/30	6 AM–1 AM
64X	Jackson Park to Cherry Hill	Peak	20/--	Peak Only	--	--	--	--
309X	Kenmore P&R to First Hill	Peak	30/--	Peak Only	--	--	--	--
C Line	Westwood Village to South Lake Union	RapidRide	6/12	24 hrs	12/12	24 hrs	15/15	24 hrs
D Line	Crown Hill to Ballard to Uptown to Downtown	RapidRide	8/12	24 hrs	12/12	24 hrs	15/15	24 hrs
E Line	Aurora Village to Downtown	RapidRide	5/10	24 hrs	12/12	24 hrs	15/15	24 hrs

All frequencies shown in minutes. SPU = Seattle Pacific University; TC = Transit Center; CC = Community College; P&R = Park and Ride.
Source: Prepared by Fehr & Peers, 2018. Ridership data provided by King County Metro for spring 2016 (King County Metro, 2017).

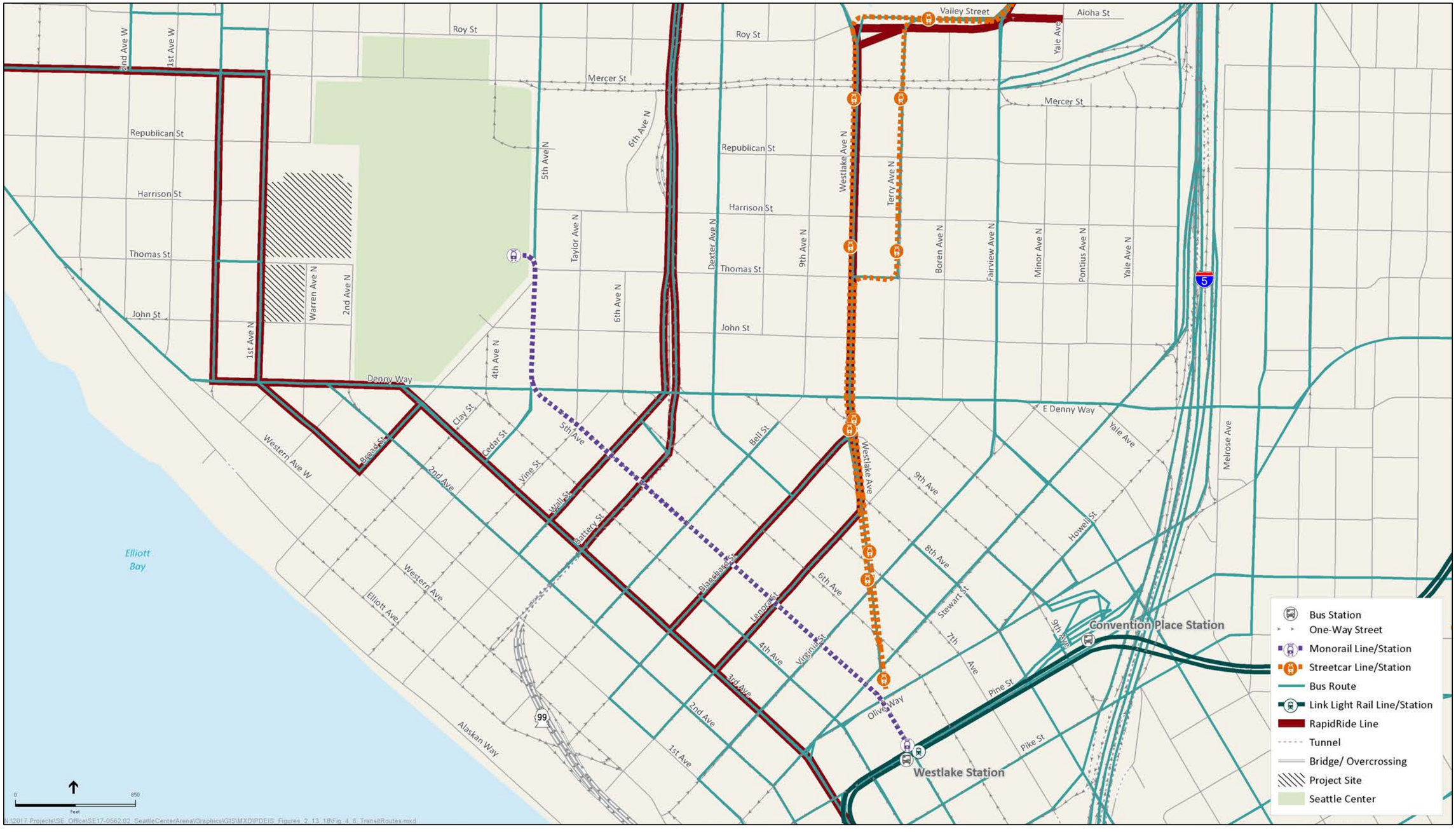


Figure 4-6. Existing Regional Transit Routes in the Study Area

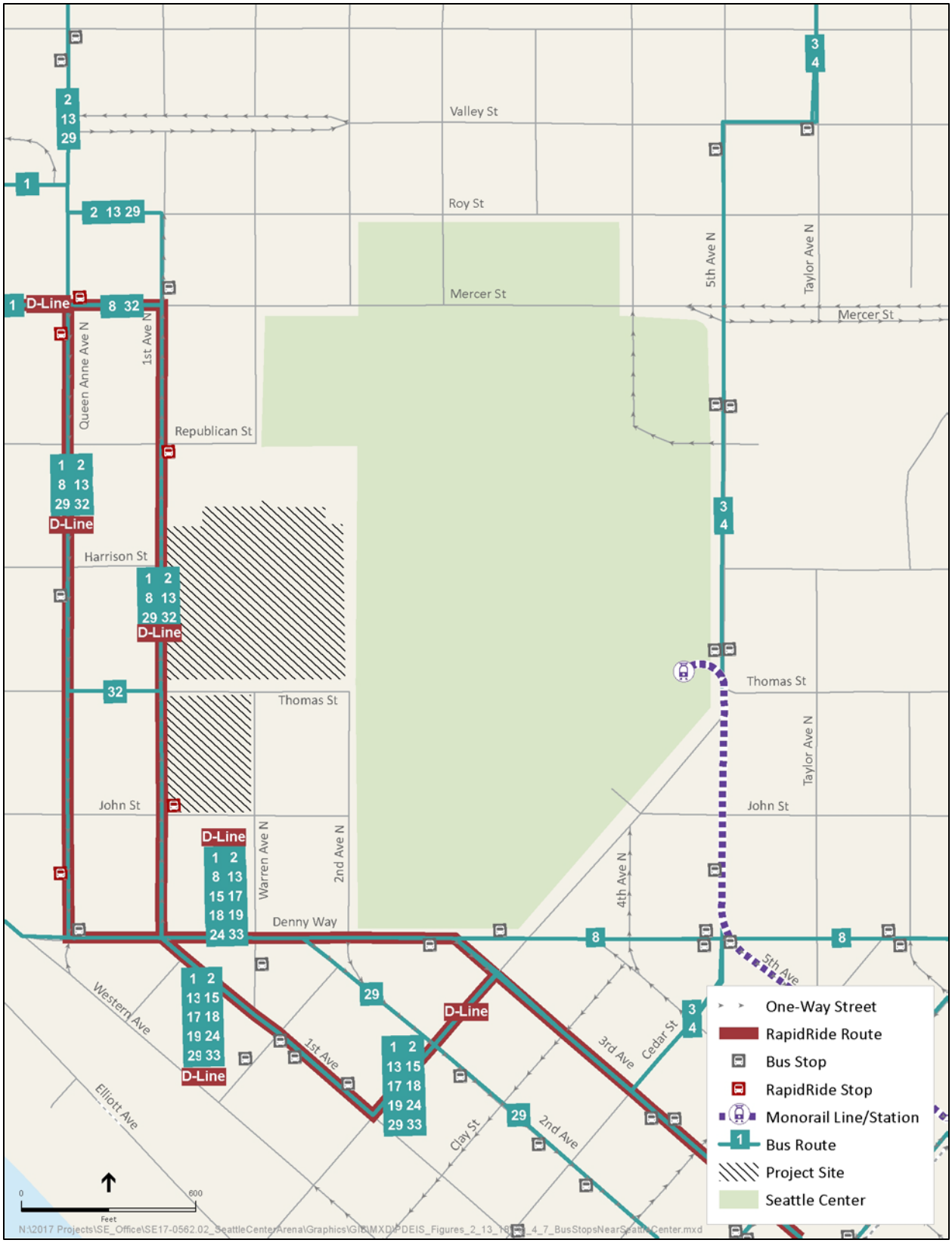


Figure 4-7. Existing Bus Routes and Stops Near the Project Site

Streetcar

As shown in Figure 4-6, the South Lake Union Line of the Seattle Streetcar operates along Westlake Ave N and Terry Ave N between Westlake Station and the South Lake Union neighborhood. This line is about two-thirds of a mile east of the project site. On weekdays, the line operates with a 10-minute frequency from 7:00 AM to 7:00 PM, and a 15-minute frequency from 6:00 AM to 7:00 AM and 7:00 PM to 9:00 PM (11:00 PM on Fridays). On weekends, the frequency is 15 minutes running from 6:00 AM to 11:00 PM on Saturdays, and 10:00 AM to 7:00 PM on Sundays and holidays. In general, the streetcar carries moderate ridership and is not typically overloaded.

Monorail

Monorail service is available between Seattle Center and Westlake Station in Downtown Seattle, as depicted in Figure 4-6. At Seattle Center, passengers can board and alight (exit) the Monorail approximately 1,000 feet east of the project site (less than a 5-minute walk). Typical operations include service every 10 minutes from 7:30 AM to 11:00 PM. The Monorail alignment carries passengers along a grade-separated track between the 2 termini. The 1-way travel time is less than 2 minutes, with an additional 2 minutes of dwell time at each terminus for passenger boardings and alightings. For large events, Monorail service can be ramped up to 5-minute frequencies, providing capacity for approximately 3,000 passengers per hour (250 passengers per train) in each direction. The actual volume of Monorail boardings varies considerably depending on the time of the year and level of activities at Seattle Center. For instance, daily boardings on days without large events at Seattle Center ranged from 10,000 to 16,000 persons in late July 2016 to 3,000 to 9,000 persons in late April 2016. Anecdotally, ridership on the Monorail increases during large Seattle Center events, although exact figures vary due to the range of events at the campus. Riding the Monorail currently requires a separate ticket purchase; however, the Monorail will be integrated with the ORCA (One Regional Card for All) fare system in 2019.

Light Rail

Sound Transit operates LINK light rail service between the University of Washington and Angle Lake in SeaTac, with a total of 16 stations. Typical operations include 6-minute peak frequencies and 10- to 15-minute off-peak frequencies, 7 days a week, with service available between 5:00 AM and 1:00 AM. Off-peak and weekend service details are as follows:

- Weekday service frequencies drop to every 10 minutes beginning at 6:30 PM and to every 15 minutes beginning at 10:00 PM.
- Saturday service is available from 5:00 AM to 1:00 AM, with 10-minute frequencies until 10:00 PM, at which point headways drop to every 15 minutes.
- Sunday service is available from 6:00 AM to 12:00 AM, with 10-minute frequencies provided until 10:00 PM, at which point headways drop to every 15 minutes.

Currently, the station nearest the project site is Westlake Station, about 1.1 miles to the south. At Westlake Station, light rail riders may transfer to the south Monorail terminus or use a variety of fixed route bus services to connect to the arena.

Sound Transit 3 (ST3), the ballot measure passed in November 2016 to expand the regional transit system, will extend the light rail system to West Seattle and Tacoma by 2030 and to Ballard by 2035 (Sound Transit, 2016). The Ballard extension will include a station planned in close proximity to

KeyArena. Construction of Sound Transit 2 (ST2) projects is already underway with light rail extensions north to Lynnwood, south to Federal Way, and east to Redmond scheduled to open by 2024. As the ST2 light rail extensions open, Seattle Center visitors from a broad regional area would be able to travel via light rail to Westlake Station and complete their trip to Seattle Center using the Monorail or other modes.

Ferry and Water Taxi Service

Figure 4-8 displays the ferry and water taxi routes. Washington State Ferries operates a fleet of ferries from Colman Dock in Downtown Seattle, about 1.5 miles from the project site. Existing ferry service from Downtown Seattle (serving both walk-on passengers and vehicles) serves Bremerton and Bainbridge Island. Ferries often reach vehicle carrying capacities during summer months, particularly during pre-event times, but in the outbound (leaving Seattle) direction. Ferries have high passenger capacities and rarely are overloaded. Metro operates 2 passenger-only water taxis from Downtown Seattle, serving Vashon Island and West Seattle. A separate passenger-only ferry operated by Kitsap Transit serves Bremerton. The Kitsap ferry experiences high outbound demand in the pre-event period and operates on a reservation system. However, the inbound trip is generally not full in the afternoons. Passenger-only ferry service between Kingston and Seattle is planned to begin in summer 2018.

4.3.4 Pedestrian and Bicycle Facilities

The project site is in a dense urban area with relatively high pedestrian and bicycle mode shares (the proportion of travel by those modes). This section summarizes the pedestrian and bicycle facilities in the vicinity of Seattle Center.

Bicycle Network

Existing bicycle facilities are shown on Figure 4-9 and consist of multi-use off-street trails, protected off-street bicycle lanes (2-way), protected in-street bicycle lanes, in-street bicycle lanes, and sharrows (a pavement marking indicating that the roadway is shared by both vehicles and bicycles). A number of other bicycle facilities and amenities are located within the project vicinity including bicycle crosswalks, bicycle signals, bicycle signal detection, and green skip-striping (to indicate areas of potential conflict) of on-street lanes through intersections and across driveways. Bicycling is permitted across the Seattle Center campus. Bicycle racks with a capacity to accommodate approximately 95 bicycles are provided adjacent to KeyArena along the west, north, and east sides. Racks accommodating roughly 20 bicycles are located a short distance away (across 1st Ave N and near the Armory). During crowded festival conditions, Seattle Center adds bicycle corrals at the perimeter of the campus for additional bicycle storage.

The bicycle network in the vicinity of Seattle Center is well developed along some corridors. Good connectivity is provided between Seattle Center and the Dexter Ave N bicycle facilities via the Mercer St protected off-street bicycle lanes. Additionally, bicycle connectivity to the east will be enhanced by the reconnection of John St, Thomas St, and Harrison St across SR 99 to Dexter Ave N in 2020 after the SR 99 Tunnel project opens. An additional proposal for a trail, known as Lake to Bay, would connect Lake Union to Elliott Bay with connections along 5th Ave N, Broad St, and Thomas St on the periphery and through the Seattle Center campus. Portions of this trail are complete, such as the section along Mercer St between 5th Ave N and Dexter Ave; portions are planned for construction, such as the protected bicycle lane along Broad St between 5th Ave N and the Elliott Bay Trail; and portions of the trail are not yet planned.

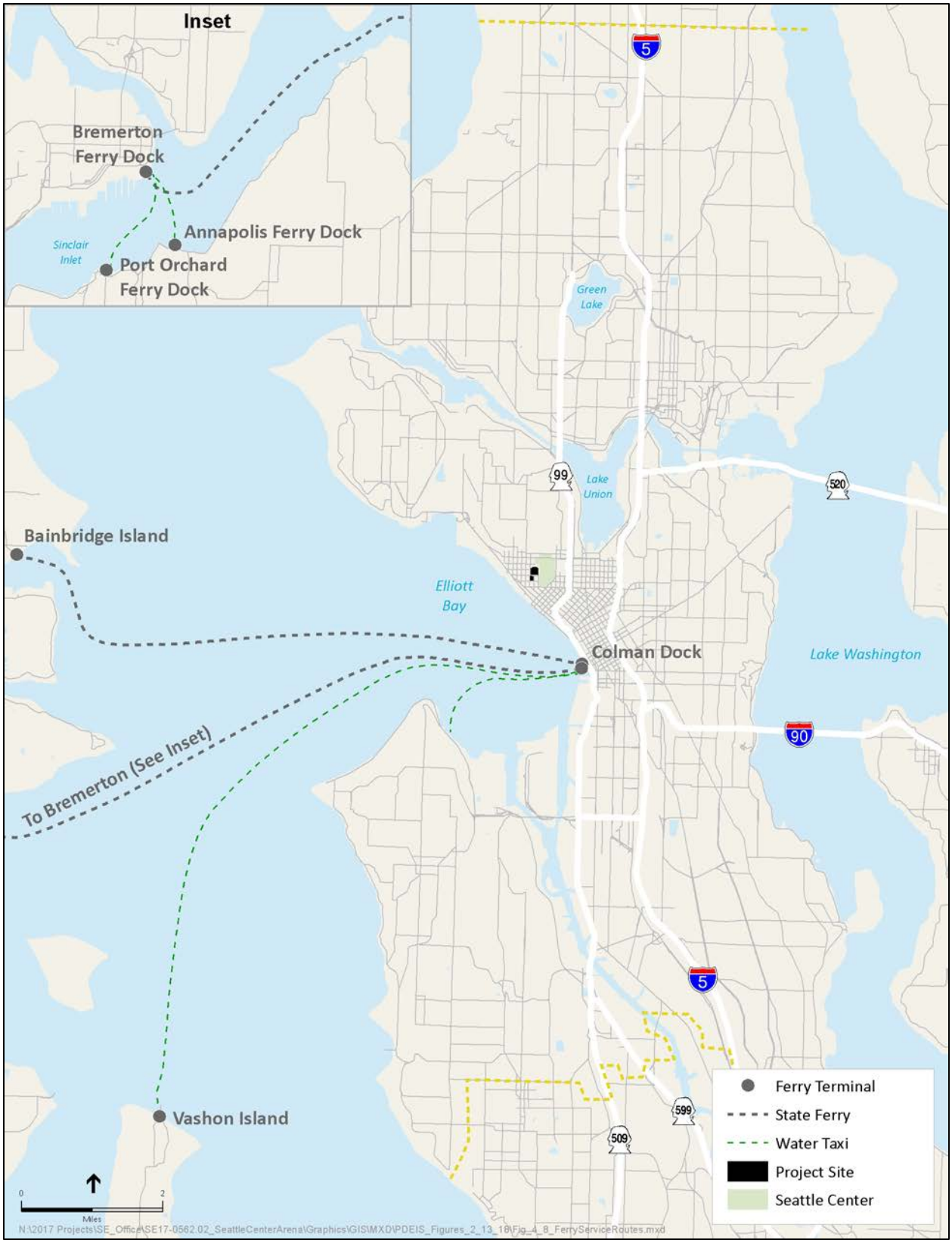


Figure 4-8. Existing Ferry and Water Taxi Routes

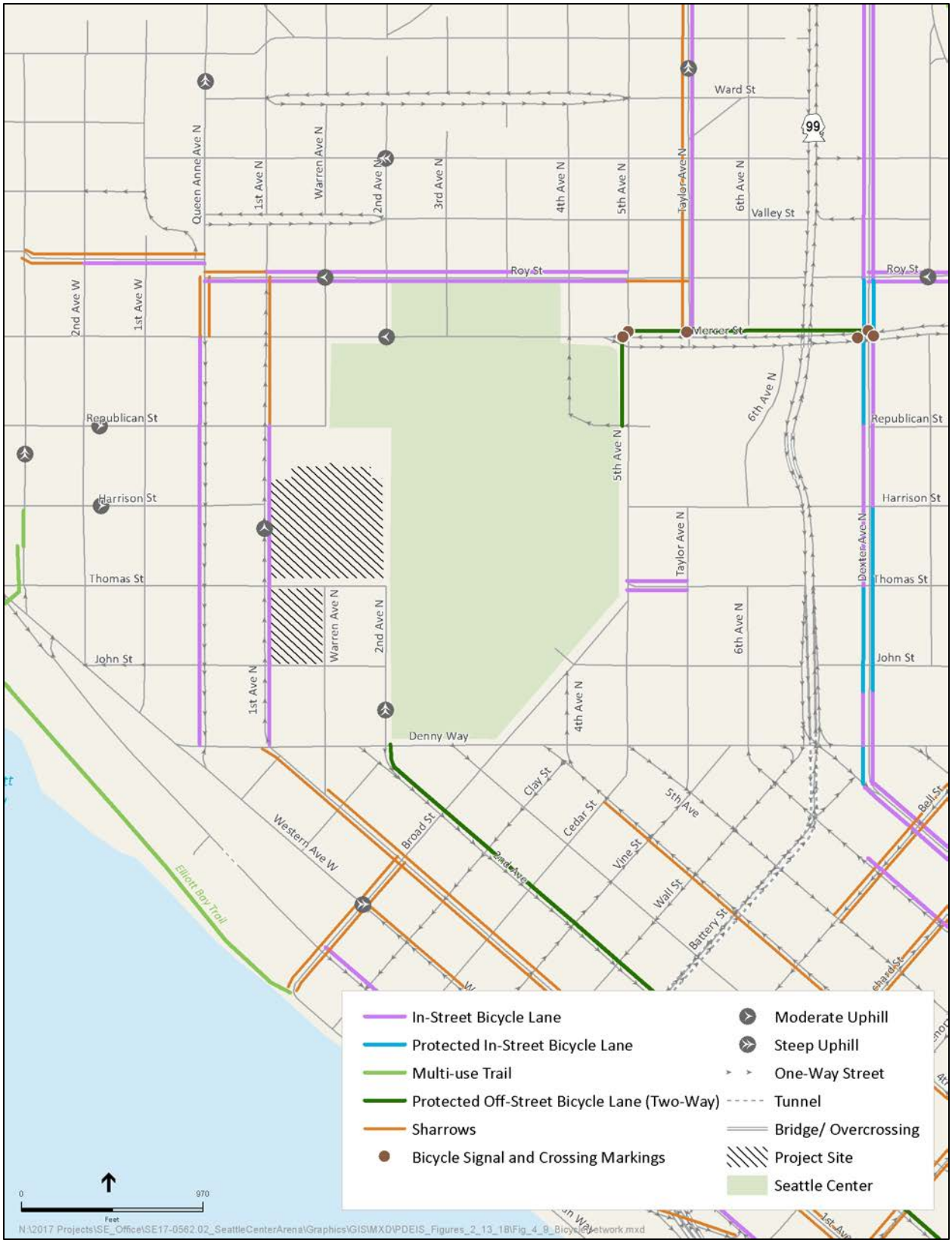


Figure 4-9. Existing Bicycle Network

1st Ave N and Queen Anne Ave N are key north-south connectors with in-street bicycle lanes. Preferred bicycle routes connecting to Downtown include 2nd Ave, 6th Ave, and 7th Ave due to the designated spaces for bicycle travel. Roy St connects bicycle trips to and from the east, but bicyclists must divert south to the Mercer St underpass to cross SR 99. East of SR 99, Roy St connects to the Dexter Ave N in-street bicycle lanes and Westlake Ave N off-street 2-way protected bicycle lane, which are key routes to neighborhoods north of the Ship Canal and into Downtown.

Dexter Ave N carries substantial volumes of bicyclists during peak periods given its connectivity between Downtown and residential areas to the north, as well as convenient and comfortable bicycling facilities. It also provides access to the protected off-street bicycle lane on Mercer St to the west. Bicyclists often have difficulties crossing Mercer St during peak periods due to vehicles that block intersections (despite the presence of "Do Not Block Intersection" signs).

Three bike share companies operate in the City of Seattle; one of the companies offers electric-assisted bikes in addition to regular bicycles. All operate with a dock-less set-up, meaning bicycles are available throughout many parts of the city and can be used through a mobile app. Bicycles can be rented for $1 to $4 per hour. Bike share bicycles are sometimes parked/stored outside of the sidewalk's furniture zone (the area between the curb and the through zone where street furniture and amenities are located), which can affect pedestrian flows during busy periods.

Protected bicycle lanes recently opened on 2nd Ave south of Denny Way. The Seattle Bicycle Master Plan Implementation Plan 2017–2021 (April 2017) includes a variety of new facilities in the project vicinity. Bicycle lanes are planned on Thomas St east of 5th Ave N with a connecting bicycle facility along the Vine St/Taylor Ave/Taylor Ave N corridor. Protected bicycle lanes are planned for portions of 1st Ave N, Queen Anne Ave N, 8th Ave, 9th Ave, Roy St, Dexter Ave N, 4th Ave, Broad St, Bell St and/or Blanchard St, and Alaskan Way.

Pedestrian Network

The pedestrian network surrounding Seattle Center is very well developed as shown on Figure 4-10. This figure also displays the various pedestrian access routes used to enter/exit Seattle Center. The vast majority of streets have complete sidewalks, although some sidewalks are temporarily closed due to adjacent property construction. Intersections near Seattle Center and on main arterials have crosswalks. Some signalized crosswalks are activated by pedestrian push buttons while others operate on auto recall (i.e., operate each phase regardless of a pedestrian call). Pedestrian countdown signals (equipment at an intersection that includes a display counting down the number of seconds remaining in the pedestrian flashing "don't walk" phase) are provided at many signalized intersections.

Many sidewalks have street signs, tree wells, bus shelters, parked vehicle encroachment (i.e., vehicles overhanging the sidewalk), and other features that limit the effective width of the walkway. Some intersections have curb bulbs to expand waiting areas for pedestrians, while others are more limited in size. Within Seattle Center, many sidewalks and walking paths accommodate travel through the campus and to the venues within the campus.

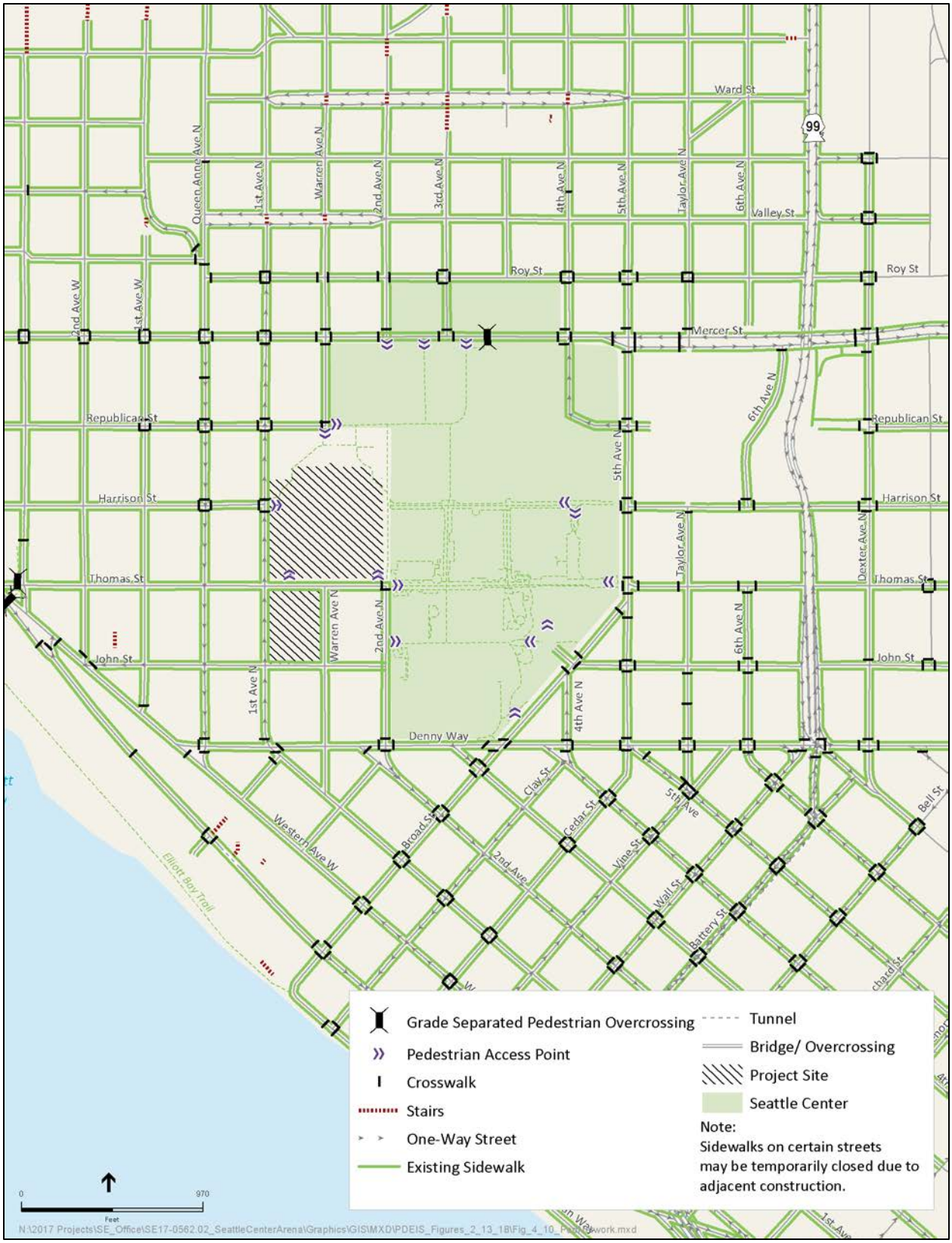


Figure 4-10. Existing Pedestrian Network

4.3.5 Parking

The parking study area was defined based on the expected distance that typical arena visitors would be willing to walk from their vehicle, based on experience with other urban arena projects and knowledge of the neighborhood. Figure 4-11 shows the supply of on-street and off-street parking within the parking study area. Parking supply data were collected from a variety of sources including SDOT and Seattle Center (SDOT, 2017; Seattle Center, 2017a). The data shown on Figure 4-11 represent parking that is currently expected to be open to the general public during a typical evening event. For off-street locations, garages or lots consisting of 50 spaces or greater were surveyed. A number of smaller garages and surface lots also serve the study area. Additional parking is provided around South Lake Union as well as in garages south of Denny Way, although those locations require walking a greater distance to reach the project site. By 2020, additional parking garages are expected to be constructed along the Dexter Ave N corridor, which would provide additional parking opportunities for arena attendees.

Figure 4-11 indicates there are 8,229 publicly available parking spaces in the parking study area. Off-street lots/garages represent 62% of the total parking supply. The 3 garages operated by Seattle Center (Mercer St Garage, 1st Ave N Garage, and 5th Ave N Garage) consist of a combined 2,944 spaces, which is 58% of the total off-street supply shown on Figure 4-11.

Figure 4-12 and Table 4-6 display the estimated evening peak parking occupancy for a typical weekday when an event is not being held at KeyArena (SDOT, 2017; Seattle Center, 2017a). Parking occupancy is summarized by the subareas shown in Figure 4-11. As shown, the total weekday evening (between 5:30 PM and 7:00 PM) peak parking occupancy was 2,691 vehicles, which represents 33% of the total available supply. On-street parking was occupied to a much greater degree than off-street parking (67% versus 11%, respectively). These findings are consistent with the 2017 Uptown & Seattle Center Strategic Parking Study (Seattle Center, 2017b), which found there is an excess of off-street parking during most daytimes and evenings, and that overall parking occupancy for evening conditions is about 35%.

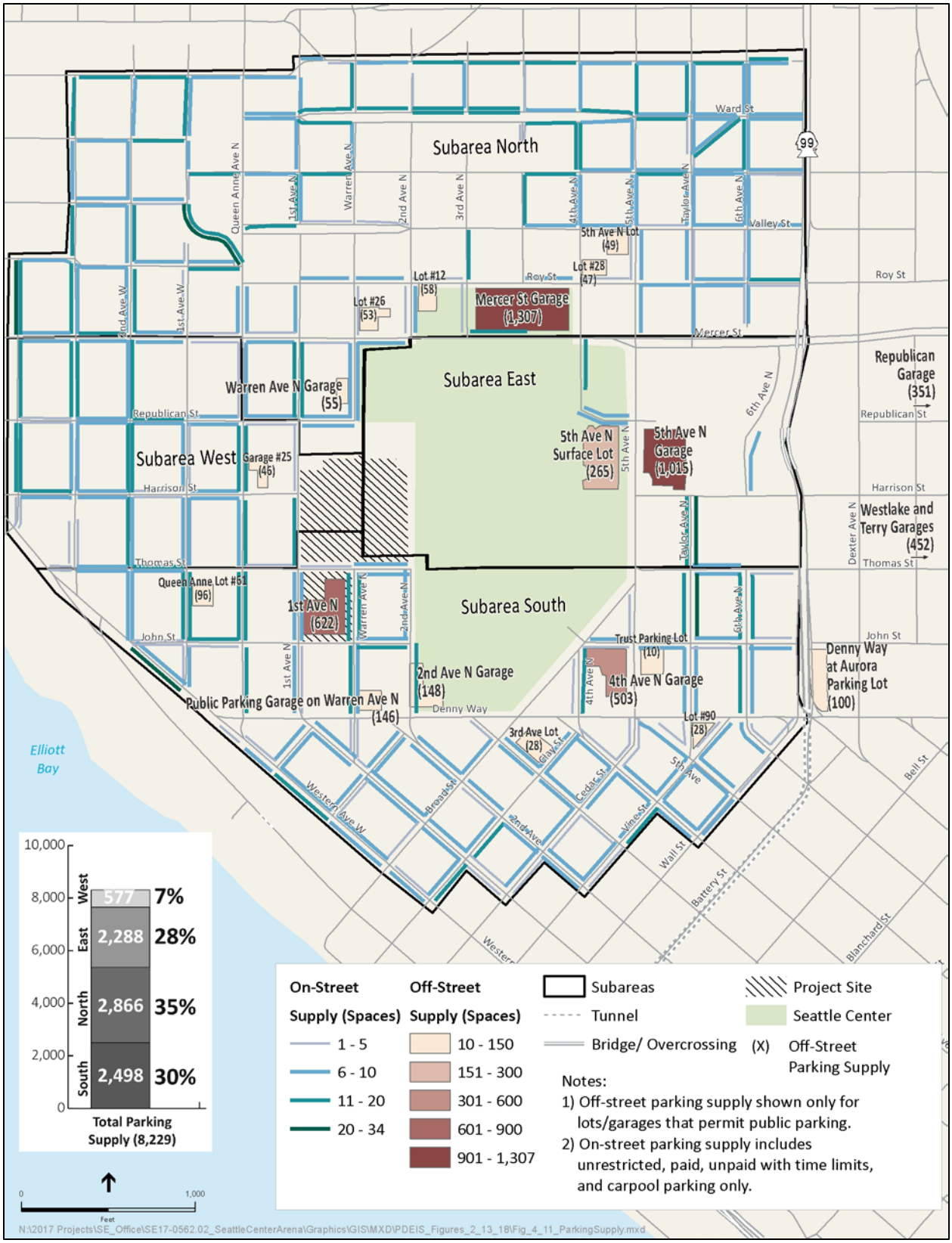


Figure 4-11. Existing Parking Supply

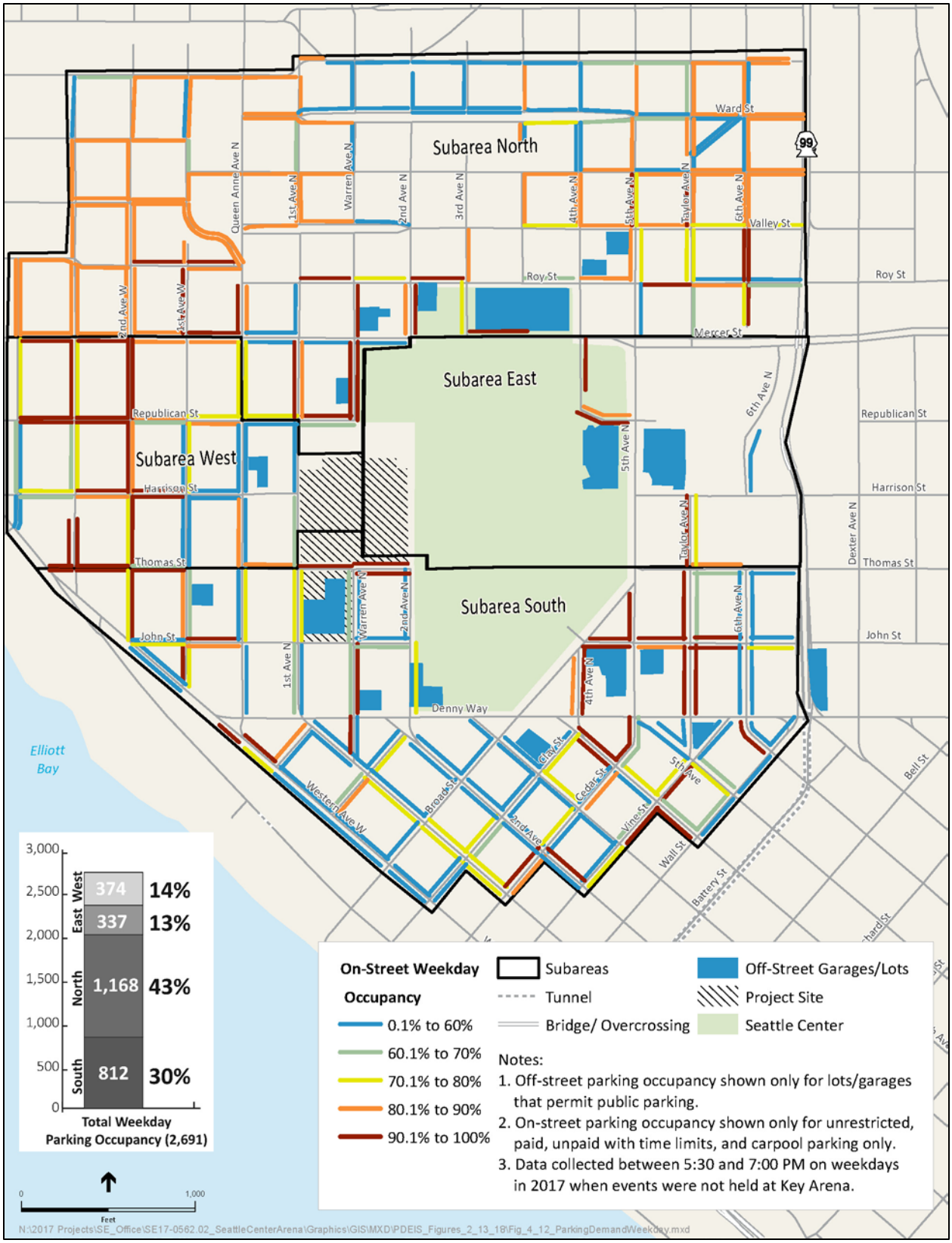


Figure 4-12. Existing Parking Occupancy During Weekday Pre-Event Peak Hour

Figure 4-13 and Table 4-6 display the estimated peak parking occupancy for a typical Saturday when an event is not being held at KeyArena (based on data collected for this EIS in September, October, and November 2017; Idax Data Solutions, 2017). Saturday evening peak parking occupancy was 3,630 vehicles, which represents 44% of the total available supply. The garages and lots surrounding Seattle Center were modestly utilized (22%), but had twice the occupancy as during the weekday condition. The overall on-street parking occupancy also increased relative to the weekday condition (from 67 to 81%). Time limits and paid parking are not in effect on Sunday, and Sunday parking studies have shown higher parking occupancy than any other study day.

Currently, most Seattle Center venue employees park in off-street garages because parking passes are offered at an inexpensive, monthly rate to employees. The number of employee vehicles occupying spaces in the garages varies depending on the events.

Table 4-6. Parking Supply and Occupancy – Existing Conditions (Pre-Event Peak Hour)

Parking Type	Subarea	Parking Supply	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	105	73 (70%)	69 (66%)
	North	1,489	1,055 (71%)	1,356 (91%)
	South	1,056	637 (60%)	708 (67%)
	West	481	348 (72%)	390 (81%)
	Subtotal	**3,131**	**2,113 (67%)**	**2,523 (81%)**
Off-Street	East	2,183	264 (12%)	272 (12%)
	North	1,377	113 (8%)	481 (35%)
	South	1,442	175 (12%)	349 (24%)
	West	96	26 (27%)	5 (5%)
	Subtotal	**5,098**	**578 (11%)**	**1,107 (22%)**
On-Street & Off-Street	**Total**	**8,229**	**2,691 (33%)**	**3,630 (44%)**

Source: Prepared by Fehr & Peers, 2018 based on data collected in September–November, 2017.

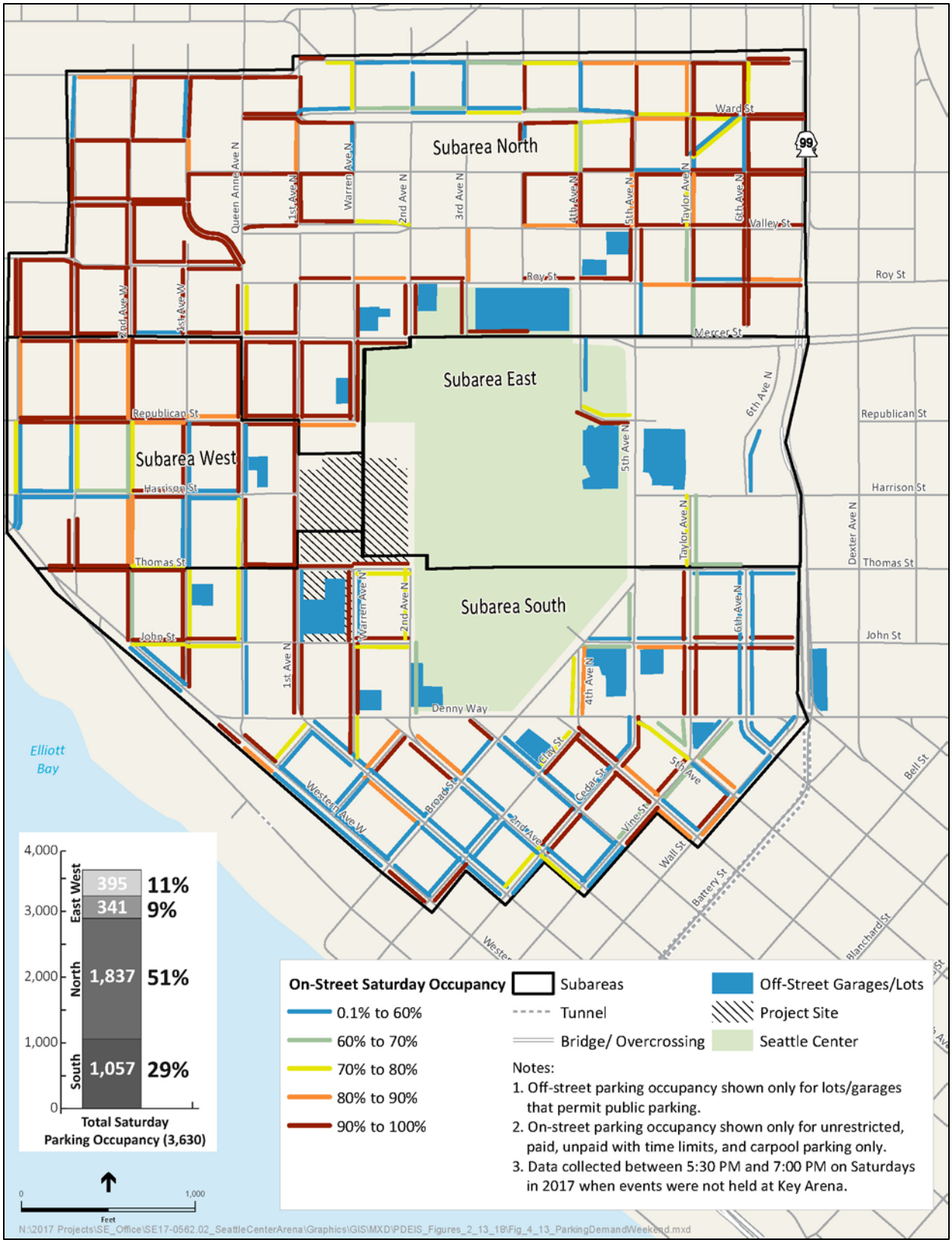


Figure 4-13. Existing Parking Occupancy During Saturday Pre-Event Peak Hour

Table 4-7 shows the availability of weekday and Saturday evening parking spaces by subarea. This table shows that there are 5,538 currently available spaces for a weekday evening when there is no event at KeyArena. Similarly, there are 4,599 currently available spaces for a Saturday evening. The vast majority of parking availability is north, east, and south of the project site. Parking availability influences directionality of pre-event and post-event pedestrian flows.

Table 4-7. Available Parking – Existing Conditions

Parking Type	Subarea	Weekday Evening Available Parking Spaces	Saturday Evening Available Parking Spaces
On-Street	East	32	36
	North	434	133
	South	419	348
	West	133	91
	Subtotal	**1,018**	**608**
Off-Street	East	1,919	1,911
	North	1,264	896
	South	1,267	1,093
	West	70	91
	Subtotal	**4,520**	**3,991**
On-Street & Off-Street (% of total by geographic area)	East	1,951 (35%)	1,947 (42%)
	North	1,698 (31%)	1,029 (23%)
	South	1,686 (30%)	1,441 (31%)
	West	203 (4%)	182 (4%)
	Total	**5,538**	**4,599**

Includes only publicly available spaces that could potentially be open to arena attendees for evening events at KeyArena or the proposed Seattle Center Arena. Does not include any planned facilities east of SR 99 that may be open by 2020 and accessible via the street grid reknitting. Such facilities are considered in the analysis as part of the Opening Day 2020 conditions analysis.

Source: Prepared by Fehr & Peers, 2018.

Seattle Center and its resident organizations employ several hundred staff, both full-time and intermittent, who regularly use parking in the 3 garages currently operated by Seattle Center. Many staff travel from outside the Seattle city limits and work off-peak hours due to their event-related schedule. Existing labor agreements include provisions for Seattle Center staff parking at below-market rates for the neighborhood. As a result of these circumstances, a portion of available parking in Seattle Center garages is often occupied by staff.

4.3.6 Ridehailing

Ridehailing vehicles, also known as Transportation Network Companies (TNCs) such as Uber and Lyft, are a rapidly growing mode of motorized urban transportation in the United States. They operate on a service platform where a smartphone app connects a passenger traveling to a predetermined

destination with a driver willing to transport them for a fare exchanged via the app. Based on a visitor survey conducted at the September 27, 2017 Janet Jackson concert at KeyArena, 15% of attendees used a ridehailing vehicle to arrive at the venue. Roughly 660 of the 9,200 concert attendees were surveyed. While a much smaller proportion of travel, taxis and other for-hire vehicles are also ridehailing vehicles.

Ridehailing vehicles typically involve passenger loading/unloading along a public street. Figure 4-4 shows that 3- or 5-minute passenger loading/unloading zones are present along portions of 1st Ave N, Mercer St, and 2nd Ave N in the vicinity of Seattle Center. Observations before and after events at KeyArena indicate that those areas are frequently used for ridehailing activity. During congested conditions (i.e., during events at KeyArena), ridehailing vehicles have been observed to stop in travel lanes (i.e., double park) along 1st Ave N and Queen Ave N to pick-up and drop-off passengers. They have also been observed to use curb space dedicated for buses and bicycle lanes. A decision by a patron to order an Uber, Lyft, or a taxi results in both an inbound trip and an outbound trip to the area, which means more vehicle trips being generated for that single patron's trip versus travel via private vehicle.

4.3.7 Other Modes

Observations at Seattle Center indicate that patrons arrive and depart from Seattle Center in a variety of travel modes beyond those described previously. Examples of these other modes include:

- Taxis
- Limousines
- Chartered buses
- Paratransit
- Car share services with either free floating (e.g., Car2Go) or designated parking (e.g., ZipCar) models
- Self/assist-powered wheeled devices such as scooters, Segways, etc.

A taxi zone exists along the Broad St frontage of Seattle Center. Designated staging for charter buses is also provided along Broad St. Paratransit is required by ADA to provide direct and convenient connections for disabled patrons. This typically means identifying curb space that is close to the venue entrance/exit and is designed to meet ADA requirements (cross slope, ADA-compliant ramps, etc.).

The Seattle Police Department manages traffic flow on certain streets near KeyArena after large events through 2 Event Traffic Control Plans (TCPs) – 1 related to the egress of the 1st Ave N Garage and the other related to egress from the Mercer Garage. These TCPs include event attendance thresholds that identify when police officer control is warranted and how many officers are likely required.

4.4 POTENTIAL IMPACTS

This section describes potential transportation impacts of the alternatives related to construction activities in the short term, and operational impacts in both the short and long term. Impacts can be direct, or indirectly caused by the alternative. Note that transportation impacts are, by their nature, considered in a cumulative context. Transportation impacts are evaluated when considering the new transportation demand layered on top of current and future foreseeable background traffic conditions.

The direct impacts caused by the proposed project are evaluated by comparing the performance of the transportation system with and without the project.

4.4.1 Scenarios Evaluated

For transportation impacts, 2 horizon years are analyzed: 2020 and 2035. As described in Section 4.3, *Affected Environment*, 3 analysis periods are analyzed: weekday pre-event (5:30 to 6:30 PM), weekday post-event (9:30 to 10:30 PM), and Saturday pre-event (6:00 to 7:00 PM). These time periods were selected to align with 2 specific types of events: a sold-out NBA basketball game on a weekday, and a sold-out concert on a Saturday. These are the 2 largest events expected to occur regularly at the renovated arena; NHL hockey games would have slightly less seating capacity than an NBA basketball game, but similar travel characteristics. Saturday post-event conditions would generally be comparable to weekday post-event conditions so that time period is not analyzed, except for transit capacity.

In addition to studying the No Action Alternative, 2 project alternatives are analyzed, as described in Chapter 2 and summarized below.

- **Alternative 1: OVG Proposal.** This alternative is the design proposed by OVG. This includes a new 450-space below-grade garage and loading dock adjacent to the arena (just north of Thomas St), and full utilization of the 1st Ave N Garage (620 parking spaces). The parking garage driveway would be on Thomas St and consists of a 3-lane cross-section. Post-event ridehailing pick-ups would be restricted to several designated locations within a boundary around Seattle Center.
- **Alternative 2: Modified Proposal.** This alternative would have different design elements to reduce the potential impact of the project. For transportation, the major difference related to Alternative 2 is a smaller parking garage under the south plaza (200 rather than 450 parking spaces and the driveway reduced to 2 lanes), and lower utilization of the 1st Ave N Garage (400 rather than 620 parking spaces). The underground loading dock and 1st Ave N Garage driveway access points would function nearly the same as Alternative 1. Ridehailing pick-ups would be regulated such that they occur outside a designated boundary around Seattle Center.

Both alternatives would provide access to the underground loading dock from a new driveway on 1st Ave N. The current driveway that serves the 1st Ave N Garage would be removed. As a result, all access to/from the 1st Ave N Garage would occur from Warren Ave N and John St.

Activity at Seattle Center varies widely depending on the events taking place on campus, ranging from days with very few scheduled events to days with multiple and/or large events. High attendance on the campus is generated in a variety of ways, for example a single large festival or an event at KeyArena, or a combination of more moderately sized events occurring simultaneously on the campus. To reflect the variability in activity at Seattle Center, 2 different conditions are evaluated in the transportation chapter: Average Seattle Center Attendance and Above-Average Seattle Center Attendance.

The Average Seattle Center Attendance scenario reflects the 50th percentile of daily Seattle Center visitors, and the Above-Average Seattle Center Attendance scenario reflects the 90th percentile of daily Seattle Center visitors. The details of the determination of these 2 activity levels are described in Appendix C, Tech Memo 2, Background Attendance Levels at Seattle Center. For simplicity, these conditions can be considered as follows:

- **Average Seattle Center Attendance:** Typical Seattle Center attendance of daily visitors and several small scheduled events. This attendance level does not include an event at KeyArena.
- **Above-Average Seattle Center Attendance:** Above-Average Seattle Center Attendance of daily visitors plus 1 or more large events. This attendance level includes an average-sized event at KeyArena.

Figure 4-14 summarizes how these Seattle Center attendance levels relate to the proposed arena renovation project. The No Action Alternative – Average Seattle Center Attendance scenario represents a typical day at Seattle Center (i.e., no major events). Alternative 1 or 2 with Average Seattle Center Attendance represents the No Action condition plus the addition of a sold-out arena event (18,350 to 19,125 additional visitors depending on whether a sporting event or concert is held). In contrast, the Above-Average Seattle Center Attendance scenario reflects a busy day at Seattle Center including events at KeyArena as well as other venues. Because the renovated Seattle Center Arena would replace KeyArena, some of the attendees assumed under the No Action Alternative would be "replaced" by attendees of the renovated Seattle Center Arena. Therefore, the difference in total Seattle Center attendance between No Action and Alternatives 1 or 2 represents a change in visitors that is less than the sold-out arena capacity.

4.4.2 Construction Impacts

This section summarizes the potential transportation impacts related to the construction of the Seattle Center Arena Renovation Project. The following defines potentially significant impacts from construction, which are short term. Impacts not reaching these thresholds are considered less-than-significant.

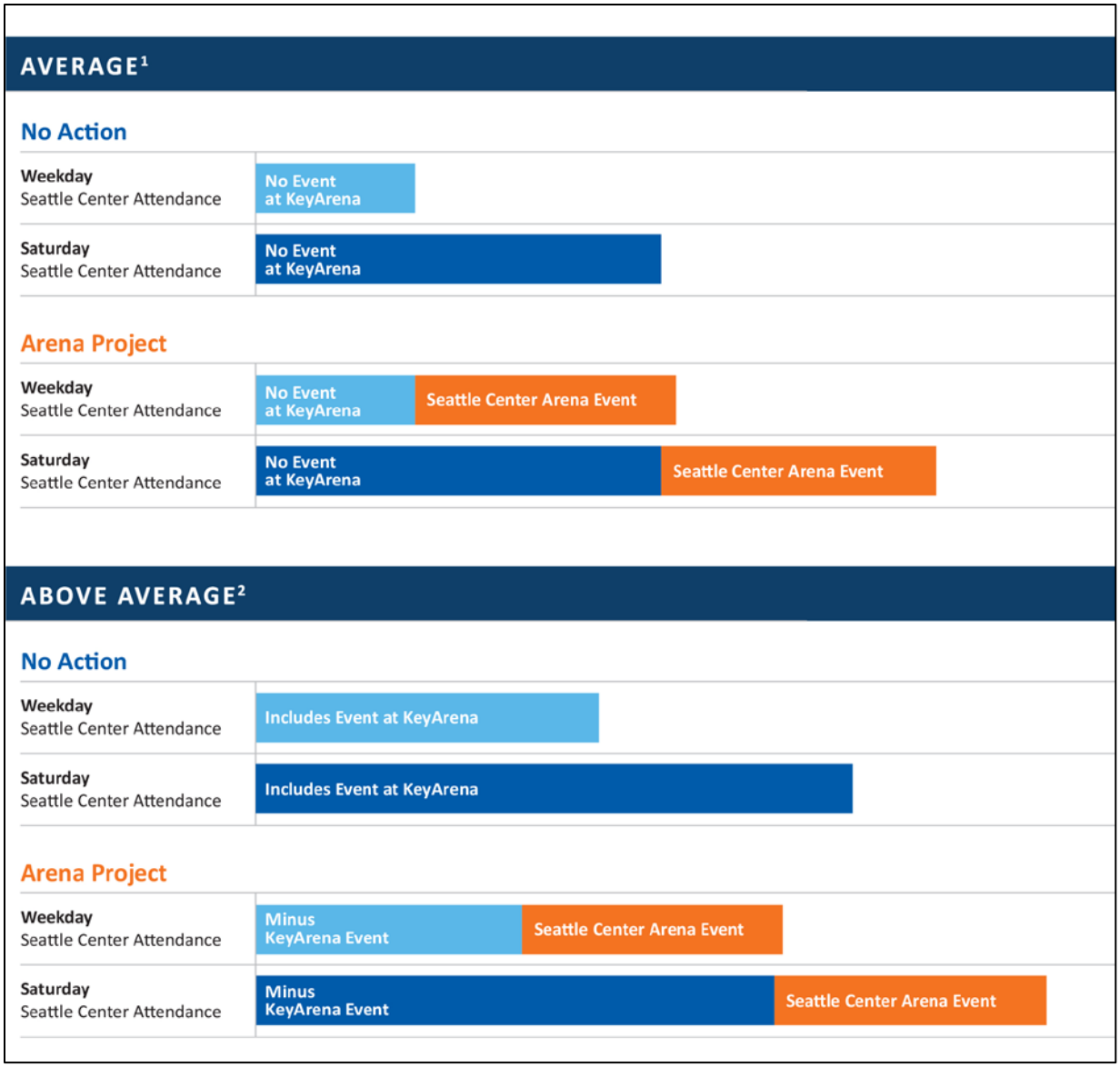
Criteria for Significant Construction Impacts to Transportation:

- Construction activity results in modifications to transportation facilities, which could substantially increase the number of conflicts between modes.
- Construction activity results in the long-term loss of bus/truck staging areas identified in the MOA between SDOT and Seattle Center (see Curb Space Management in Section 4.3.2).
- Construction activities would result in significant traffic operations or parking impacts as defined in Section 4.4.3, *Operations Impacts*.

Construction in the city may result in the closure of sidewalks, transit facilities, bicycle facilities, and vehicle lanes, all of which require a street use permit from SDOT. These types of closures are not considered a significant impact since they are common throughout areas like Uptown, South Lake Union, and Downtown.

<u>No Action Alternative</u>

No construction is proposed at the project site under this alternative, so there would be no construction-related transportation impacts.



1. Average Seattle Center Attendance is the 50th percentile of daily attendance and is assumed not to include an event at KeyArena.
2. Above-Average Seattle Center Attendance is the 90th percentile of daily attendance and is assumed to include a moderately-size event at KeyArena.

Figure 4-14. Seattle Center Attendance Scenarios

Alternative 1: OVG Proposal

Based on information from OVG, construction is expected to take approximately 24 months and would start in the fall of 2018. Under Alternative 1, construction would occur throughout the day and night, including truck hauling at night. The greatest construction-related impacts would be related to the closure of transportation facilities (lanes, streets, sidewalks, bicycle facilities, bus stops, etc.) to facilitate demolition, materials, staging, and construction. Up to 200 workers at a time are expected to be on-site, working in 2–3 shifts per day (between 400–600 total daily construction workers). The project would generate a substantial number of truck trips during portions of construction to haul away material from

the construction site. Per the information in Section 2.6, truck trips are not anticipated during the AM or PM peak hours.

Based on information from OVG, the following closures are expected:

- Thomas St between 1st Ave N and Warren Ave N is expected to be closed for the duration of construction activity.
- All but the south curbside lane of Thomas St between Warren Ave N and 2nd Ave N would be closed for the duration of construction activity; the south curbside lane would be open for 1-way vehicle circulation.
- The parking/loading lane along the east side of 1st Ave N between John St and the north end of the KeyArena plaza (just south of the Metro bus stop) is expected to be closed for the first 18 months of construction and intermittently thereafter.
- Temporary lane restrictions are also planned along John St and Warren Ave N for curb cut revisions and utility connections.

Traffic Operations

The primary traffic operations impacts are related to the closure of streets and traffic lanes identified above. Because the parking/loading lane along 1st Ave N between John St and the north end of the KeyArena plaza does not provide any vehicle capacity, no traffic operations impacts are anticipated from the closure of this lane; however, some short-term traffic operations impacts could be caused by flaggers restricting traffic in travel lanes to allow trucks to enter/exit the curbside lane. Short-term traffic operations impacts to facilitate 1-lane/1-way traffic flow on John St, Warren Ave N, and Thomas St (between Warren Ave N and 2nd Ave N) are also likely.

In addition to the closures identified above, the EIS Consultant Team considered the potential for trips generated by construction workers, and trucks to impact traffic operations. Construction activities would occur 24 hours a day, 7 days a week. The 200 construction workers on-site are not anticipated to cause significant impacts to area traffic operations. No substantial traffic operations impacts from trucks are anticipated since they would operate during off-peak periods. The heavy truck traffic could deteriorate the pavement quality on the haul routes – Mercer St, Denny Way, and 1st Ave N – but this degradation of pavement is not expected to be severe enough to result in a significant traffic operations impact.

Transit

Construction activity is expected to close the following transit facilities:

- The bus layover area at the north end of the parking/drop-off lane on 1st Ave N (at the north end of the KeyArena plaza). This layover area is approximately 100 feet long and typically accommodates a single bus.
- The bus stop along 1st Ave N located north of John St (affecting Routes 1, 2, 8, 13, and RapidRide D).

These facilities are expected to be closed for the first 18 months of construction and intermittently thereafter until construction is complete.

Pedestrian

Construction activity is expected to close the following pedestrian facilities:

- The sidewalk along 1st Ave N from the north end of the KeyArena plaza to John St for the first 18 months and intermittently thereafter.
- The sidewalks along both sides of Thomas St between 1st Ave N and Warren Ave N and the north sidewalk along Thomas St between Warren Ave N and 2nd Ave N for the entire duration of the project.
- The sidewalks along Warren Ave N (west side of street) and John St (north side of street) adjacent to the 1st Ave N garage intermittently throughout the duration of construction.

The sidewalks along Thomas St mentioned above are expected to be closed for the duration of the construction period. The other sidewalk closures are expected to be shorter in duration and intermittent. The exact timing and extent of the closures are not known at this time; however, the 1st Ave N sidewalk closure is related to the closure of the parking/drop-off lane and is expected to last 18 months during the beginning of the project and intermittently throughout the construction period. The other closures would likely be intermittent and shorter in duration and are related to curb cut refinements and utility relocations. Pedestrian access to Seattle Center to and from the west would be affected by the construction because access would be limited between Republican St and John St. A portion of 2nd Ave N, north of Thomas St, is vacated as a public street, but is used as a part of the Seattle Center campus for loading/unloading as well as events. The western half of the vacated portion of 2nd Ave N would be closed for the duration of construction. See Appendix B, Table B-3 for a list of events/performances that would be impacted by closure of vacated 2nd Ave N on the Seattle Center campus.

Bicycle

Construction activity is expected to close the following bicycle facility:

- The bicycle lane along 1st Ave N from the north end of the KeyArena plaza to John St.

The exact timing and extent of the bicycle lane closure is not known at this time; however, like the other 1st Ave N closures, the closure would likely occur at the beginning of the project construction and last about 18 months with intermittent closures later throughout the construction period.

Parking

The street and lane closures described above would impact on-street parking during construction. The following on-street parking closures are expected:

- 1st Ave N between Harrison St and John St.
- Thomas St between Warren Ave N and 2nd Ave N.
- Warren Ave N between Thomas St and John St.
- John St between 1st Ave N and Warren Ave N.

The parking along Thomas St is expected to be closed for the duration of the construction activities, and like the street closures described above, the exact timing and duration of the other on-street parking closures are not known at this time. Along 1st Ave N, on-street parking would likely be closed for

approximately 18 months near the beginning of construction to facilitate demolition and intermittently thereafter throughout the duration of construction. However, depending on how pedestrian and bicycle traffic is accommodated through the construction area, it is possible that parking could be eliminated throughout the duration of construction on both sides of 1st Ave N to allow for safe pedestrian and bicycle travel through the construction area. Parking closures on Warren Ave N and John St are anticipated to be of shorter duration and intermittent to facilitate curb cut and utility modifications.

In addition to the on-street parking, OVG is planning to use the 1st Ave N Garage and the adjacent surface lot for construction materials storage and construction worker vehicle parking. These uses would reduce the capacity of the garage, but OVG plans on keeping a portion of the garage open to the public.

Bus/Truck Staging

Charter buses and trucks currently stage using curb space in the vicinity of the project site in accordance with the SDOT and Seattle Center MOA for Event Curbside Management (SDOT and Seattle Center, 2011). Through that agreement, Seattle Center reserves curb space on Thomas St, Warren Ave N, 2nd Ave N, Republican St, 4th Ave N, and Roy St for loading, unloading, and staging of events.

The closure of the northside curb lane of Thomas St between Warren Ave N and 2nd Ave N could result in the loss of the bus/truck staging area used for event loading/unloading identified in the MOA on 1 or both sides of the street, depending on how the closure is implemented. This closure would last the duration of the construction period, which would be a significant impact to bus/truck staging. The closures on Warren Ave N and John St are temporary and not considered a significant impact. See Appendix B, Table B-4 for a list of events/performances that would be impacted by the proposed street closures on Thomas St.

Safety

The closures of parking/loading lanes, sidewalks, and bicycle facilities all could result in a substantial increase in modal conflicts within the study area.

Summary of Transportation Impacts During Construction under Alternative 1

As described above, construction to renovate the arena would result in a variety of impacts to transit facilities, pedestrian, bicycle, parking, truck/bus staging, event loading/unloading, and safety. Some of the impacts would result in an inconvenience during construction, for example requiring travelers to find another route or another location to park, but do not rise to a significant level of impact due to their type of effect and temporary nature. However, safety impacts related to the closed pedestrian and bicycle facilities, and the reduction in bus/truck staging areas are all significant impacts.

Mitigation measures for the construction-related impacts are identified in Section 4.5.1, *Construction Mitigation*.

Alternative 2: Modified Proposal

Construction-related transportation impacts of Alternative 2 are similar to Alternative 1; however, construction activities would be conducted between 7 AM and 7 PM, with potential further time restrictions on truck hauling (e.g., truck hauling could be restricted to 8:30 AM to 3:30 PM, to avoid peak hours). The reduced construction window would change several conditions related to construction impacts on transportation:

- The overall construction duration would increase beyond 24 months, to at least 30 months.
- The partial closure of Thomas St between Warren Ave N and 2nd Ave N would include the north curbside and north travel lane only. The south travel lane would be open for 1-way vehicle circulation, and the south curbside lane would be available for loading/parking.
- The duration of demolition activities would increase by 6 months or more, which would increase the length of time that some facilities are closed from 18 to 24 months or more.
    - The parking/loading lane along the east side of 1st Ave N between John St and the north end of the KeyArena plaza (just south of the Metro bus stop) is expected to be closed for at least the first 24 months of construction and intermittently thereafter.
    - The sidewalk along 1st Ave N from the north end of the KeyArena plaza to John St is expected to be closed for at least the first 24 months and intermittently thereafter.
- There would be fewer truck trips per day since the demolition period is extended over more months; however, there may be more mid-day truck trips. Truck trips are not expected to impact traffic operations to any substantial degree.

Significant construction impacts on the transportation system from Alternative 2 are expected to be the same as for Alternative 1: safety impacts from the closed pedestrian and bicycle facilities, and the reduction in bus/truck staging areas from construction activities. However, the duration of closures and the impacts associated with those closures would be longer under Alternative 2 than Alternative 1.

4.4.3 Operations Impacts

Two horizon years are analyzed in this section: 2020 and 2035. Year 2020 is assumed to be the year of opening of the arena, and year 2035 provides a longer term cumulative condition that is consistent with the City's land use and transportation plans, as well as regional plans including LINK light rail expansion.

Thresholds of Significance

The following defines long-term (operations) impacts to the transportation system. The No Action Alternative is the baseline against which impacts of the action alternatives are evaluated. Potential significant operations impacts to transportation are defined as follows, and impacts not reaching these thresholds are considered less-than-significant.

Traffic Operations

Criteria for Significant Operations Impacts on Traffic Operations:

- A signalized intersection operates acceptably (i.e., LOS D or better) under the No Action Alternative, but under Alternative 1 or 2 the operation of that signalized intersection is unacceptable (i.e., LOS E or F) and that signalized intersection would have an additional delay of at least 5 seconds per vehicle.
- A signalized intersection operates unacceptably (i.e., LOS E or F) under the No Action Alternative, and under Alternative 1 or 2 that signalized intersection would have an additional delay of at least 5 seconds per vehicle.
- Alternative 1 or 2 would cause a substantial increase in delays (i.e., well into a LOS F condition) and also result in modal conflicts at an unsignalized intersection due to the magnitude of traffic

generated by the arena, proximity to major arena entrances/garage access points, and other conditions.

- Alternative 1 or 2 would cause the average corridor travel speed on Mercer St or Denny Way to decrease to 40% or less of the free-flow speed during the weekday pre-event peak hour.
- Free-flow speeds on Mercer St or Denny Way under the No Action Alternative are already 40% of the free-flow speed, and Alternative 1 or 2 would further decrease the average corridor travel speed by another 5% during the weekday pre-event peak hour.
- Alternative 1 or 2 would cause freeway off-ramp queues that spill back onto the I-5 mainline.
- Freeway off-ramp queue spills back onto the mainline under the No Action Alternative, and Alternative 1 or 2 would result in a substantial increase in freeway off-ramp queue length.

These criteria were developed based on conditions unique to the project and its location, as well as past practices of the City on other EISs. The City typically considers LOS D as the minimum desired operating condition in downtown urban areas. A 5-second increase in delay is frequently used in transportation assessments because it is considered a value beyond which the public may perceive a noticeable difference in traffic conditions. Given the highly directional nature of athletic and other special events, directional travel time is important to consider because signalized intersection LOS measures the overall operation of an intersection versus a single approach. The use of 40% of the free-flow speed is supported by the Highway Capacity Manual (Transportation Research Board, 2010). Freeway off-ramp queuing is important because under certain conditions, traffic spillbacks can adversely affect freeway operations and/or cause speed differentials in adjacent lanes, which could affect safety.

In 2016 and 2017, Fehr & Peers staff visited stadiums/arenas in urban areas of San Diego, CA, Portland, OR, Washington DC, Salt Lake City, UT, San Francisco, CA, Atlanta, GA, and Denver CO. Observations focused on a variety of operational strategies, ranging from the use of advanced signage, lane closures, parking best practices, special TNC pick-up/drop-off locations, expanded transit service, special accommodation for travel by bicycle and walking, and other considerations. These observations were insightful in understanding how these factors can influence urban stadiums/arenas operations. They were also used in the development of significance criteria for the travel modes described below.

Ridehailing

Criteria for Significant Operations Impacts from Ridehailing:

- If ridehailing vehicles or other pick-up/drop-off vehicles block vehicle through lanes to pick-up/drop-off passengers (unless accompanied by a Transportation Management Program [TMP] that safely permits such activities).
- If ridehailing vehicles wait in bicycle facilities or bus pullouts to pick-up/drop-off passengers.

These criteria were selected based on observed travel conditions during events at KeyArena and other venues. When vehicle pick-ups/drop-offs occur in travel lanes, congestion can quickly form and pedestrians may walk between idling vehicles.

Transit

Criteria for Significant Operations Impacts to Transit:

- Additional ridership would cause a transit route (including buses, Monorail, or LINK light rail) serving the project site to exceed its crowding threshold.
- A transit route serving the project site travels through intersections whose LOS has been significantly impacted as defined in the *Traffic Operations* section, resulting in additional delay for that route.

The crowding thresholds are based on Metro and Sound Transit guidelines; the traffic operations threshold is consistent with that used for other vehicle traffic above.

Pedestrians

Criteria for Significant Operations Impacts to Pedestrians:

- Pedestrian demand on a sidewalk or crosswalk exceeds capacity, causing pedestrians to walk on streets that are open to vehicular or bicycle traffic.

This criterion reflects the inherent differences in safety for persons walking versus traveling in a vehicle (private, TNC, or bus). Pedestrian flows that repeatedly spill onto streets can cause conflicts between travel modes, and often require proactive pedestrian flow management as part of a TMP.

Bicycles

Criteria for Significant Operations Impacts to Bicycles:

- Bicycle facilities are consistently (i.e., for the majority of the analysis period) blocked by pedestrian overflows from corners, sidewalks, or bus stops, resulting in conflicts between bicycles and other modes.
- On-street bicycle facilities are consistently blocked by vehicles picking up or dropping off patrons at the project site resulting in conflicts between bicycles and other modes.
- Insufficient bicycle parking is provided for event attendees or employees.

These criteria reflect the inherent differences in safety for persons biking versus traveling in a vehicle (private, TNC, or bus). Bicycle flows that consistently spill into vehicle lanes or sidewalks can cause conflicts between travel modes, and often require proactive management as part of a TMP. Insufficient bicycle parking may lead to bicycles parked in locations that cause modal conflicts.

Parking

Criteria for Significant Operations Impacts to Parking:

- The demand for parking would substantially increase, which then causes adverse effects to other travel modes such as vehicles blocking crosswalks/driveways; vehicle conflicts with buses, pedestrians, or bicycles; and vehicles circulating for multiple blocks looking for parking.

Bus/Truck Staging

Criteria for Significant Operations Impacts to Bus/Truck Staging:

- Charter buses/trucks used for event loading/unloading stage on study area streets without obtaining SDOT permits, resulting in modal conflicts between authorized curb space users that were displaced.

This threshold is based on the existing MOA regarding curb space management between Seattle Center and SDOT.

Paratransit

Criteria for Significant Operations Impacts to Paratransit:

- Paratransit vehicles lack designated loading/unloading curb space adjacent to the project site.
- Paratransit vehicles are blocked from accessing designated loading/unloading curb space by non-transit vehicles.

This threshold is in place to ensure easy access to the arena.

Safety

Criteria for Significant Operations Impacts to Safety:

- There is a substantial increase in the collision rate at an intersection identified as a high collision location.
- Pedestrian or bicycle safety is compromised as a result of modal conflicts identified by the pedestrian and bicycle impact thresholds.

These thresholds are based on City standard practices to address safety concerns.

2020 Impacts

The transportation system will change substantially by 2020 due to growing traffic volumes and the opening of the SR 99 Tunnel and reknitted streets across SR 99. Refer to Figure 4-15 for configuration of the reknitted roadway network between 5th Ave N, Dexter Ave N, Mercer St, and Denny Way. This figure displays 11 additional intersections selected for micro-simulation study in this area based on the reknitted street grid (Intersections 59–69). Another 6 intersections (Intersections 70–75) are evaluated qualitatively under the future year scenarios. Specific LOS values are not provided for Intersections 70 through 75, but conclusions regarding likely impacts are presented based on queuing observed in the micro-simulation model and knowledge of their current operations.

In addition to the reconnected street grid, which would serve all modes, a variety of pedestrian, bicycle, and transit projects are expected to be built by 2020. See Appendix C, Tech Memo 3, Year 2020 and 2035 Background Transportation Network, for more details on the projects planned to be in place by 2020.

Figure 4-15. 2020 Street Network

No Action Alternative

This section describes the conditions of the transportation system under the No Action Alternative in which KeyArena is not renovated. The No Action Alternative is the baseline against which the impacts of the project are assessed. In other words, the 2020 No Action Alternative represents the anticipated transportation conditions in 2020 without the proposed project, while Alternatives 1 and 2 represent conditions with a renovated arena.

Under the No Action Alternative, KeyArena would continue to hold events, although those events would be smaller and less frequent than under Alternatives 1 and 2. The Average Seattle Center Attendance scenario represents a day with no event taking place at KeyArena, and the Above-Average Seattle Center Attendance scenario represents a day with an event at KeyArena.

Traffic Operations

Traffic volume forecasts were developed for 2020 conditions using the PSRC regional travel demand model. The forecasts take into account existing volumes, planned land use growth within the immediate study area (as well as throughout the city and region), and changing traffic patterns associated with planned projects such as the SR 99 Tunnel. These forecasts represent changing travel demand and travel patterns that would occur with no renovation at KeyArena (and assuming an event is not being held at KeyArena). The following describes the expected growth in traffic between existing and 2020 No Action Alternative – Average Seattle Center Attendance conditions for the weekday pre-event peak hour:

- **Mercer St** – The eastbound direction is forecast to experience traffic growth in the range of 150 to 225 vehicles over existing conditions. This represents a modest increase (13%) near Fairview Ave N, but a fairly sizeable increase (45%) west of Queen Anne Ave N. Since traffic levels on eastbound Mercer St west of Queen Anne Ave N are only 15% of the volume present at Fairview Ave N, similar increases in added vehicles across the corridor show larger percentage increases to the west. Traffic growth on westbound Mercer St is in the 10% to 15% range, with a net increase of 75 to 150 vehicles depending on the location.
- **Denny Way** – The eastbound direction is forecast to experience traffic growth in the range of 175 to 225 vehicles, which would represent a 20% to 33% increase over existing conditions. Traffic growth on westbound Denny Way is in the 5% to 15% range, with a net increase of 25 to 125 vehicles depending on the location.

Average Seattle Center Attendance

Intersection delay and corridor travel times are expected to increase substantially by 2020 independent of arena renovation. Overall, the proportion of intersections operating at LOS E or F would increase from 19% under existing conditions to 59% under 2020 No Action – Average Seattle Center Attendance conditions.

Eastbound travel operations of Mercer St and Denny Way are expected to experience greater queue spillback due to additional traffic growth. Results from the Vissim model output show that the percent demand served on these corridors drops well below 100%, indicating over-capacity conditions that would result in a longer period of major congestion on study area roadways.

Percent demand served is defined as the proportion of the hourly vehicle demand that is able to travel through the street network. When percent demand served falls well below 100%, there is more demand than capacity and some vehicles would not be able to enter the model's street network. This results in a longer period with congested traffic conditions (i.e., peak hour spreading).

During the weekday post-event and Saturday pre-event peak hours in 2020, the Denny Way/Stewart St intersection would operate at LOS E. All other intersections would operate at LOS D or better.

The weekday post-event and Saturday pre-event peak hours do not experience the same percent demand served issues that are present during the weekday pre-event peak hour. In other words, even with growth in the area, the additional traffic would be able to travel through the study area with relatively little congestion. This is because congestion on I-5, which impedes the flow of eastbound traffic on each corridor during the pre-event peak hour, is not present to the same degree during the weekday post-event and Saturday pre-event peak hours.

Travel time along Mercer St and Denny Way was analyzed to identify corridor travel speed impacts. Table 4-8 summarizes projected travel speeds by 2020. Refer to Figure 4-16 for directional LOS on segments of Mercer St and Denny Way between Seattle Center and I-5. This table reveals the following findings:

- A comparison of Figure 4-16 with Figure 4-4 indicates that average travel speeds on Mercer St between Seattle Center and I-5 would be unchanged relative to existing weekday pre-event peak hour conditions. However, greater levels of queue spillback occur in the eastbound direction, so it would take a motorist more time (in 2020 versus existing conditions) to travel the entire Mercer corridor from Elliott Ave W to I-5.
- On Denny Way, the average eastbound travel speed between Seattle Center and I-5 decreases from 3 MPH under existing conditions to 2 MPH under 2020 No Action Alternative conditions. The westbound travel speed decreases from 9 MPH under existing conditions to 7 MPH under 2020 No Action Alternative conditions. This means the average travel speed would decrease from 90% to 70% of the base free-flow speed.

See Appendix C, Tech Memo 6, 2020 Analysis Results for Roadway and Pedestrian Systems for detailed traffic operations analysis results for the 2020 condition.

Table 4-8. Corridor Travel Speed – 2020 No Action Alternative – Average Seattle Center Attendance

Corridor	2020 Weekday Pre-Event Peak Hour			
	Eastbound		Westbound	
	Average Travel Speed (MPH)	% of Free Flow Speed	Average Travel Speed	% of Free Flow Speed
Mercer St	2	20%	10	100%
Denny Way	2	20%	7	70%

MPH = miles per hour. Average free-flow travel speed of 10 MPH assumed given the presence of controls and measured speeds in this range under mostly free-flow conditions on these corridors.

Source: Prepared by Fehr & Peers, 2018.

Above-Average Seattle Center Attendance

Due to the additional increment of visitors to the Seattle Center campus, the Above-Average Seattle Center Attendance scenario would result in operations that are worse than those expected with Average Seattle Center Attendance.

Figure 4-16. Directional Level of Service and Travel Time on East/West Roadways – 2020 No Action Alternative – Average Seattle Center Attendance Weekday Pre-Event Peak Hour Conditions

On a day with Above-Average Seattle Center Attendance, the proportion of intersections operating at LOS E or F would increase from 59% (under 2020 No Action – Average Seattle Center Attendance conditions) to 67%. Further, the number of these intersections operating at LOS F would increase from 32 to 40. Refer to Appendix C, Tech Memo 6, 2020 Analysis Results for Roadway and Pedestrian Systems, for more detail.

Eastbound travel time along Mercer St and Denny Way would remain similar to the Average Seattle Center Attendance scenario, but the additional traffic would degrade westbound travel speed on Mercer St from 10 MPH (under 2020 No Action – Average Seattle Center Attendance conditions) to 4 MPH. Table 4-9 summarizes projected travel speeds by 2020.

Table 4-9. Corridor Travel Speed – 2020 No Action Alternative – Above-Average Seattle Center Attendance

Corridor	2020 Weekday Pre-Event Peak Hour			
	Eastbound		Westbound	
	Average Travel Speed (MPH)	% of Free Flow Speed	Average Travel Speed (MPH)	% of Free Flow Speed
Mercer St	2	20%	4	40%
Denny Way	2	15%	7.5	75%

MPH = miles per hour.

Source: Prepared by Fehr & Peers, 2018.

Ridehailing

Under the No Action Alternative in 2020, ridehailing is expected to operate the same as it does today. Pick-ups and drop-offs would occur in those locations most convenient to drivers and passengers rather than in a designated area.

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions, pick-up and drop-off activity would not consistently block through lanes, bicycle facilities, or bus pullouts.

Above-Average Seattle Center Attendance

Under Above-Average Seattle Center Attendance conditions, more visitors are traveling to Seattle Center, and ridehailing would occur within a more congested traffic environment. Drivers may have a more difficult time finding appropriate curb space for loading and unloading, resulting in more frequently blocked through lanes, bicycle facilities, or bus pullouts. This condition is expected to be similar to what currently occurs during major events at Seattle Center and at large KeyArena events.

Transit

Average Seattle Center Attendance

As noted in Appendix C, Tech Memo 4, Existing Conditions, a variety of King County Metro bus routes currently serve Seattle Center. All routes currently have peak rider loads that are less than the route's crowding capacity threshold. However, many of these routes are well utilized, and standing is not uncommon. Under the No Action Alternative in 2020, ridership levels would be similar, if not slightly greater (e.g., 5%) than current levels due to continued development in the area, which adds ridership demand. This increase would not cause ridership levels to reach the crowding threshold based on the current reserve capacity of each line. Similarly, the Monorail would have ample reserve capacity under the No Action Alternative in 2020.

Buses would continue to operate on roadways such as Denny Way that are currently congested. Moreover, the traffic operations analysis results indicate worsening congestion on 1st Ave N and Queen Anne Ave N between Denny Way and Mercer St during the weekday pre-event peak hour under the No Action Alternative in 2020. Therefore, bus travel time and reliability would degrade as congestion increases.

Above-Average Seattle Center Attendance

Under the 2020 No Action Alternative – Above-Average Seattle Center Attendance, Seattle Center events (including those at KeyArena) would cause surges in transit ridership before and after events. Although the reserve capacity on an hourly basis is capable of accommodating the surges, post-event attendees may need to wait longer to board a bus with available capacity, as some buses could fill at the Seattle Center stops. Additionally, post-event traffic congestion on 1st Ave N would degrade travel times and cause buses difficulty accessing bus stops.

Pedestrian Travel

Average Seattle Center Attendance

Observations of pedestrian activity on a typical day with Average Seattle Center Attendance suggest that no sidewalks or crosswalks routinely have demand exceeding capacity during the analysis periods.

Above-Average Seattle Center Attendance

Observations of pedestrian activity on a typical day with Above-Average Seattle Center Attendance (for example, a mid-sized event at KeyArena) suggest that no sidewalks or crosswalks routinely have demand exceeding capacity. However, it is noted that large events (i.e., over 10,000 persons) can temporarily result in such conditions at certain locations near the event venue (which could be KeyArena or another Seattle Center venue, depending on the large event location).

Bicycle Travel

As described previously, all 2020 scenarios would result in greater degrees of congestion on most streets when compared to existing conditions. The congestion on portions of 1st Ave N, Queen Anne Ave N, 5th Ave N, and Dexter Ave N are particularly notable as these streets have on-street bicycle lanes. Bicyclists may feel less comfortable traveling on these streets when adjacent lanes experience "stop-and-go" traffic. Such conditions can result in side-street vehicles encroaching into the major street to merge, thereby temporarily blocking the bicycle lane. Conversely, further reductions in auto travel time reliability could make travel to the venue by bicycle more attractive.

The reknitting of east-west streets (Harrison St, Thomas St, and John St) between 5th Ave N and Dexter Ave N would provide new east-west bicycle facilities that could encourage bicycle travel. These facilities may be particularly desirable given the lack of bicycle facilities on Denny Way between 1st Ave N and Aurora Ave N. Bicycle parking supply would remain the same as existing conditions under the No Action Alternative.

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions, no bicycle facilities are expected to be consistently blocked by pedestrian overflows or vehicles dropping off or picking up patrons.

Above-Average Seattle Center Attendance

Under Above-Average Seattle Center Attendance conditions, no bicycle facilities are expected to be consistently blocked by pedestrian overflows from sidewalks or crosswalks. However, vehicles (ridehailing or otherwise) are likely to temporarily block bicycle facilities when dropping off or picking up passengers.

Parking

On-street parking supply in 2020 is expected to remain similar to existing conditions. New developments within the study area would add some off-street supply within a walkable distance to the project site, particularly to the east. The Seattle Center employee parking demand is expected to remain similar to current conditions, with a large percentage of employees parking in off-street garages because parking is provided at an inexpensive, monthly rate.

Average Seattle Center Attendance

Table 4-10 summarizes parking occupancy under Average Seattle Center Attendance conditions. Total on-street parking occupancy is expected to be 67% on a weekday and 81% on a Saturday. Total off-street parking occupancy is expected to be 12% on a weekday and 23% on a Saturday.

Table 4-10. Parking Occupancy – 2020 No Action Alternative – Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	73 (70%)	69 (66%)
	North	1,055 (71%)	1,356 (91%)
	South	637 (60%)	708 (67%)
	West	348 (72%)	390 (81%)
	Subtotal	**2,113 (67%)**	**2,523 (81%)**
Off-Street	East	273 (13%)	275 (13%)
	North	147 (11%)	532 (39%)
	South	190 (13%)	364 (25%)
	West	26 (27%)	5 (5%)
	Subtotal	**636 (12%)**	**1,176 (23%)**
On-Street & Off-Street	**Total**	**2,749 (33%)**	**3,699 (45%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Refer to Figure 4-11 for each geographic parking subarea.

Source: Prepared by Fehr & Peers, 2018.

Above-Average Seattle Center Attendance

Table 4-11 summarizes parking occupancy under Above-Average Seattle Center Attendance conditions. With above-average attendance, parking occupancy would increase for both on-street and off-street facilities, although most of the additional demand is expected to use off-street parking due to its close proximity to various Seattle Center venues. Total on-street parking occupancy is expected to be 69% on a weekday and 82% on a Saturday. Total off-street parking occupancy is expected to be 46% on a weekday and 53% on a Saturday.

Table 4-11. Parking Occupancy – 2020 No Action Alternative – Above-Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	73 (70%)	69 (66%)
	North	1,085 (73%)	1,386 (93%)
	South	657 (62%)	728 (69%)
	West	348 (72%)	390 (81%)
	Subtotal	**2,163 (69%)**	**2,573 (82%)**
Off-Street	East	688 (32%)	895 (41%)
	North	1,130 (82%)	1,082 (79%)
	South	580 (40%)	740 (51%)
	West	26 (27%)	5 (5%)
	Subtotal	**2,424 (46%)**	**2,722 (53%)**
On-Street & Off-Street	**Total**	**4,587 (56%)**	**5,295 (64%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Refer to Figure 4-11 for each geographic parking subarea.

Source: Prepared by Fehr & Peers, 2018.

Bus/Truck Staging

Charter buses and trucks currently stage using curb space in the vicinity of the project site in accordance with the SDOT and Seattle Center MOA for Event Curbside Management (SDOT and Seattle Center, 2011). Through that agreement, Seattle Center reserves curb space on Thomas St, Warren Ave N, 2nd Ave N, Republican St, 4th Ave N, and Roy St for loading, unloading, and staging of events. It is assumed this arrangement stays in place and all KeyArena charter bus and truck staging consistent with that arrangement is permitted by SDOT. In other words, there are no changes related to charter buses or truck staging under the No Action Alternative.

Paratransit

Under the No Action Alternative, paratransit vehicles would continue to load and unload along the east side of 1st Ave N adjacent to KeyArena, as well as on 2nd Ave N just south of KeyArena. This designated passenger loading/unloading curb space would be available under both Seattle Center attendance conditions. However, with an unregulated ridehailing system, it is likely that the passenger

loading/unloading space used by paratransit would sometimes be blocked by non-transit vehicles during periods of high demand.

Safety

No study intersections are identified as high collision locations.

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions, pick-up and drop-off activity generally does not block through lanes, bicycle facilities, or bus pullouts so bicycle facilities are not expected to be affected from a safety perspective.

Above-Average Seattle Center Attendance

Under Above-Average Seattle Center Attendance conditions, bicycle safety may be affected by vehicles (ridehailing or otherwise) temporarily blocking bicycle facilities when dropping off or picking up passengers.

Summary of Transportation Conditions in 2020 – No Action Alternative

During an Average Seattle Center Attendance condition (i.e., no event at KeyArena), substantial intersection delay and low eastbound travel speed on Denny Way and Mercer St result in traffic operations falling below the City's standards. The degraded intersection LOS and travel speed are caused by local and regional growth in the area. Although transit capacity is expected to be sufficient under 2020 No Action Alternative – Average Seattle Center Attendance, the traffic operations conditions indirectly affect transit service during the weekday pre-event peak hour. These conditions are related to commute traffic throughout the Uptown, South Lake Union, Belltown, and Downtown Urban Centers.

During an Above-Average Seattle Center Attendance condition, such as a mid-sized event at KeyArena or another Seattle Center venue, more localized effects are experienced in the study area in addition to the degraded traffic operations and transit conditions described above. Because ridehailing vehicles would not have regulated loading and unloading locations under the No Action Alternative, it is expected that they would frequently block through lanes, bicycle facilities, and bus pullouts during events, adversely affecting transit, bicycle travel, paratransit, and safety (similar to what currently exists at KeyArena during events).

Alternative 1: OVG Proposal

With a renovated arena, Alternative 1 would result in larger and more frequent events that could affect the transportation system. This section describes the potential impacts to transportation that are likely under Alternative 1.

The travel characteristics of arena attendees are key to understanding how the project may affect the transportation system. These characteristics include considerations such as the mode of travel an attendee uses, their origin and destination, and when they choose to travel. The EIS Consultant Team considered a variety of data to estimate project travel characteristics, including KeyArena attendee mode share, KeyArena attendee geographic distribution, and travel characteristics at comparable sports and concert arenas such as mode share, trip origin and destination, temporal distribution, and average vehicle occupancy. Table 4-12 summarizes the mode share estimates for attendees of the arena.

Table 4-12. Expected Mode Share for Arena Attendees in 2020

Travel Mode	Weekday NBA Game Pre-Event Peak Hour	Weekday NBA Game Post-Event Peak Hour	Saturday Concert Pre-Event Peak Hour	Notes
Private Vehicle	63%	67%	68%	Some of these trips may also include longer walks or bike share bicycle travel to the arena to/from a remote lot/garage.
Bus	8%	6%	6%	Reflect transit trips to/from routes adjacent to Seattle Center. Bus/LINK light rail to Westlake & ferry trips are assumed to arrive to arena by walk, bicycle, TNC, Monorail, or bus.
Taxi/TNC/Other Drop-off	15%	12%	15%	Percentages represent final primary mode of travel to/from Seattle Center vicinity. Travel by ferry, or bus/LINK light rail to Westlake Station is associated with some of these trips.
Walk	10%	10%	8%	
Monorail	3%	4%	2%	
Bicycle	1%	1%	1%	

Source: Prepared by Fehr & Peers, 2018. Refer to Appendix C, Tech Memo 5, Project Travel Characteristics – Year 2020.

An average vehicle occupancy (AVO) factor is necessary to estimate the total number of vehicles that would transport attendees to the arena based on the mode share percentages in Table 4-12. Based on observations at KeyArena and comparable venues, the following estimates are applied for arena attendees in 2020 (refer to Appendix C, Tech Memo 5, Project Travel Characteristics – Year 2020, for more details):

- Weekday NBA Game:
  - 2.3 persons per vehicle during pre-event peak hour.
  - 2.45 persons per vehicle during post-event peak hour (higher AVO due to shift in TNC/bus mode in pre-event to private vehicle, i.e., carpooling on the return trip).
- Saturday Concert:
  - 2.4 persons per vehicle during pre-event peak hour.

Temporal distribution estimates of arrivals and departures are also required to determine the trip generation during the analysis periods. Observations at KeyArena and comparable venues were used to develop the following estimates for arena attendees in 2020:

- Weekday NBA Game:
  - 60% of vehicles arrive during pre-event peak hour.
  - 95% of vehicles depart during post-event peak hour.
- Saturday Concert:
  - 50% of vehicles arrive during pre-event peak hour.

Note that not all the attendees arrive or leave the venue via vehicle within the pre- or post-event peak hour. This reflects the fact that many patrons arrive early to the neighborhood to eat, drink, or socialize. While less common in the post-event condition, some patrons would also stay late after an event to "wait out" traffic congestion, likely at area restaurants and bars.

Table 4-13 summarizes the arena trip generation estimates using the mode share, AVO, and temporal distribution estimates described above. These estimates reflect the sold-out capacity for the renovated arena and apply to both Alternatives 1 and 2. During the weekday pre-event peak hour, attendees arriving to the venue by TNC, taxi, or other drop-off would result in approximately 720 outbound vehicle trips, some of which would be added to the peak eastbound travel directions on Mercer St and Denny Way.

Table 4-13. Peak Hour Vehicle Trip Generation of Proposed Arena (Alternatives 1 and 2) in 2020

Traveler Type	Weekday NBA Game Pre-Event Peak Hour Vehicle Trips			Weekday NBA Game Post-Event Peak Hour Vehicle Trips			Saturday Concert Pre-Event Peak Hour Vehicle Trips		
	In	Out	Total	In	Out	Total	In	Out	Total
Attendees traveling by private vehicle	3,016	0	3,016	0	4,776	4,776	2,709	0	2,709
Attendees traveling by TNC/taxi/drop-off vehicle	718	718	1,436	910	910	1,820	598	598	1,196
Employees traveling by private vehicle	30	0	30	0	60	60	30	0	30
Employees traveling by TNC/Taxi/Drop-off	2	2	4	4	4	8	2	2	4
Miscellaneous[1]	15	5	20	5	10	15	15	5	20
Total	**3,781[2]**	**725**	**4,506**	**919**	**5,760[2]**	**6,679**	**3,354**	**605**	**3,959**

1. Miscellaneous trips include delivery vehicles, emergency vehicles, utility vehicles, etc.

2. Weekday pre-event inbound trips and weekday post-event outbound trips are not equal due to differing mode share assumptions, AVO, and temporal distribution of travel for each analysis period.

Source: Prepared by Fehr & Peers, 2018.

The distribution of trips to the arena would be different for weekday NBA games versus Saturday concerts due to different attendee geographic and demographic characteristics, familiarity with different modes of travel, and frequency of visiting the area. Additionally, the effects of weekday home-to-work travel, which result in a greater likelihood of some Downtown workers traveling to the arena directly from Downtown, also influence both mode split and trip distribution. Spatial distribution of ticket purchases for a variety of KeyArena events were reviewed to develop a geographic distribution estimate. Table 4-14 summarizes the estimates used for this EIS analysis, and a full discussion of the process is found in Appendix C, Tech Memo 5, Project Travel Characteristics – Year 2020.

Table 4-14. Trip Origin/Destinations of Attendees

Origin/Destination	Weekday NBA Game [1]	Saturday Concert
Northwest Seattle / Shoreline	2%	1.5%
North Seattle / Lake Forest Park	1.5%	2%
Kenmore / Bothell / Woodinville	2%	2%
Ballard / Crown Hill	6%	4.5%
Northeast Seattle	4.5%	2.5%
Kirkland / Redmond	12%	5%
Magnolia / Queen Anne	2%	2%
Westlake / South Lake Union / Uptown	3%	2%
Capitol Hill / Central District	4.5%	4.5%
Downtown / Belltown	3%	2%
Bellevue / Mercer Island	8.5%	3%
West Seattle / South Seattle / Renton	5%	6.5%
SeaTac / Tukwila / Kent	3%	5.5%
Renton/Covington	5%	4%
Sammamish / Issaquah	7%	4%
Snohomish / Millcreek	5%	4.5%
Everett / Edmonds	3%	5%
Other	23%	39%

1. NBA weekday basketball game percentages do not reflect the patrons who work in Downtown, South Lake Union, or Uptown and who are less likely to travel from home to attend a game. These workers were accounted for in the trip generation and mode share calculations – see Appendix C, Tech Memo 5. Some patrons are also likely to arrive early and/or stay late prior to event. This table does not account for their location immediately prior or after an event. However, this temporal pattern is described above and is accounted for in the analysis.

Source: Prepared by Fehr & Peers, 2018.

For more details on project travel characteristics, see Appendix C, Tech Memo 5, Project Travel Characteristics – Year 2020.

Traffic Operations

Traffic volumes associated with the renovated arena, as described above, were layered on top of the No Action Alternative forecasts for the traffic operations analysis. This approach is conservative in that it assumes no redistribution of background traffic away from the streets near Seattle Center during event evenings. Figure 4-17 displays the traffic growth (over the No Action Alternative) on key corridors resulting from Alternative 1. This figure indicates that the greatest increase in inbound travel occurs along Mercer St from I-5. However, a number of other roadways also experience increases in traffic.

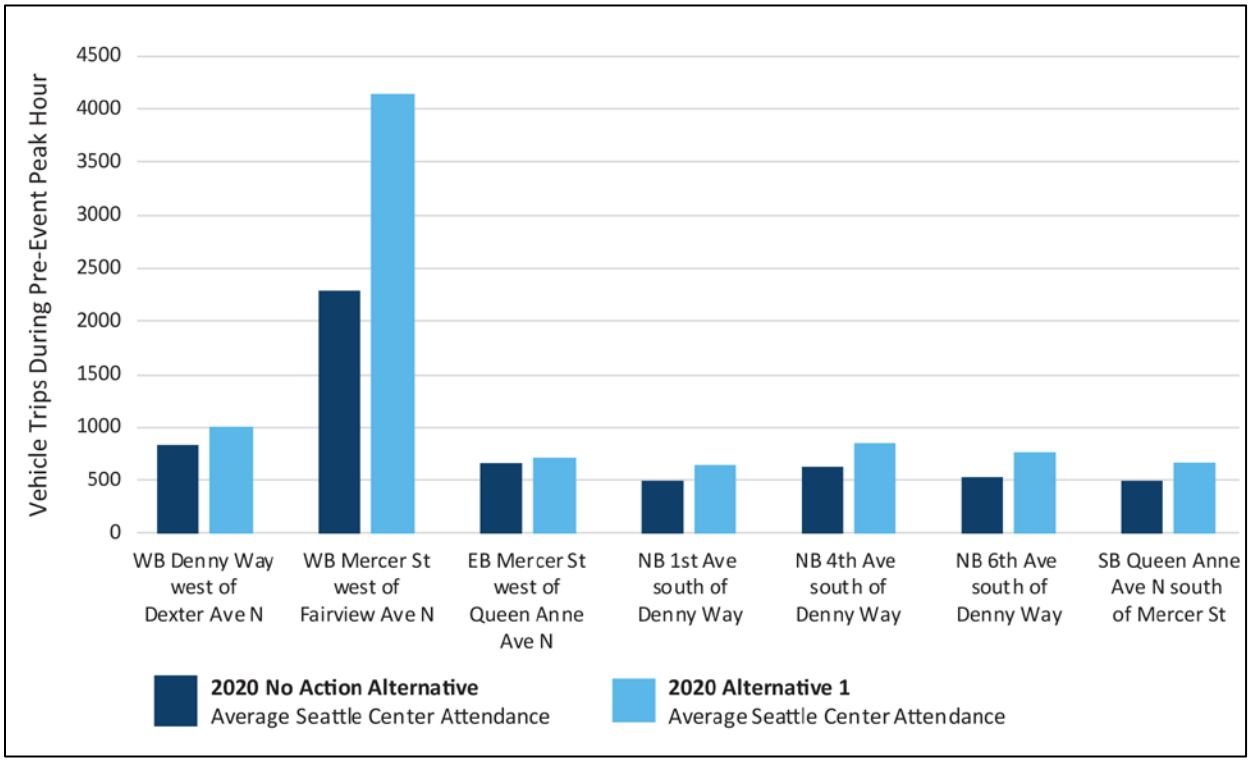


Figure 4-17. Project Traffic Growth on Key Corridors – 2020

This analysis scenario does not assume any formalized traffic management strategies to accommodate arriving attendees during the pre-event peak hour. Assumptions include the following: Signals operate in normal mode, no turning movement restrictions are present, advanced signage is not provided to direct motorists to available parking, traffic control officers are not present at intersections, parking garage occupancy levels are not managed, no changes to existing on-street parking management are implemented, ridehailing vehicles are not restricted in their passenger drop-off behavior, and no measures are taken to encourage attendees to travel by non-auto modes.

Seattle Center and SDOT currently use several traffic management strategies during the post-event period after KeyArena events; these would continue under Alternative 1 or 2. These strategies include the following:

- Placement of traffic control officers at the 2nd Ave N/Denny Way intersection to assign right-of-way and accommodate the heavy southbound flow on 2nd Ave N. Left-turns onto eastbound Denny Way are prohibited.
- Closure of Thomas St between 1st Ave N and Warren Ave N.
- Westbound right-turn prohibited from Harrison St and the north driveway of the 5th Ave N Garage onto northbound 5th Ave N to discourage travel toward Mercer St corridor.
- Special event signal timings on the Mercer St and Denny Way corridors.

Average Seattle Center Attendance

Figure 4-18 displays the number of intersections operating at LOS D or better, LOS E, and LOS F for Average Seattle Center Attendance conditions under the No Action Alternative and with Alternatives 1 and 2 (Alternative 2 is described in a subsequent section). Note that Western Ave W/Denny Way and Denny Way/Queen Anne Ave N are considered separate intersections (and labeled 28 and 28a on Figure 4-2 and subsequent figures) so the number of total intersections is 70. Key findings from this figure include the following:

- Under weekday pre-event peak hour conditions, the number of intersections operating at LOS E or F would be similar between the No Action Alternative and Alternative 1. However, Alternative 1 would cause a number of significant intersection impacts due to added delays at intersections already operating unacceptably under the No Action Alternative.
- Under weekday post-event peak hour conditions, the number of intersections operating at LOS E or F would increase dramatically, from 1 under the No Action Alternative to 36 under Alternative 1.
- Under Saturday pre-event peak hour conditions, the vast majority of intersections would continue operating at LOS D or better. The proportion operating at operating at LOS E or F would increase from 1% under the No Action Alternative to 9% under Alternative 1.

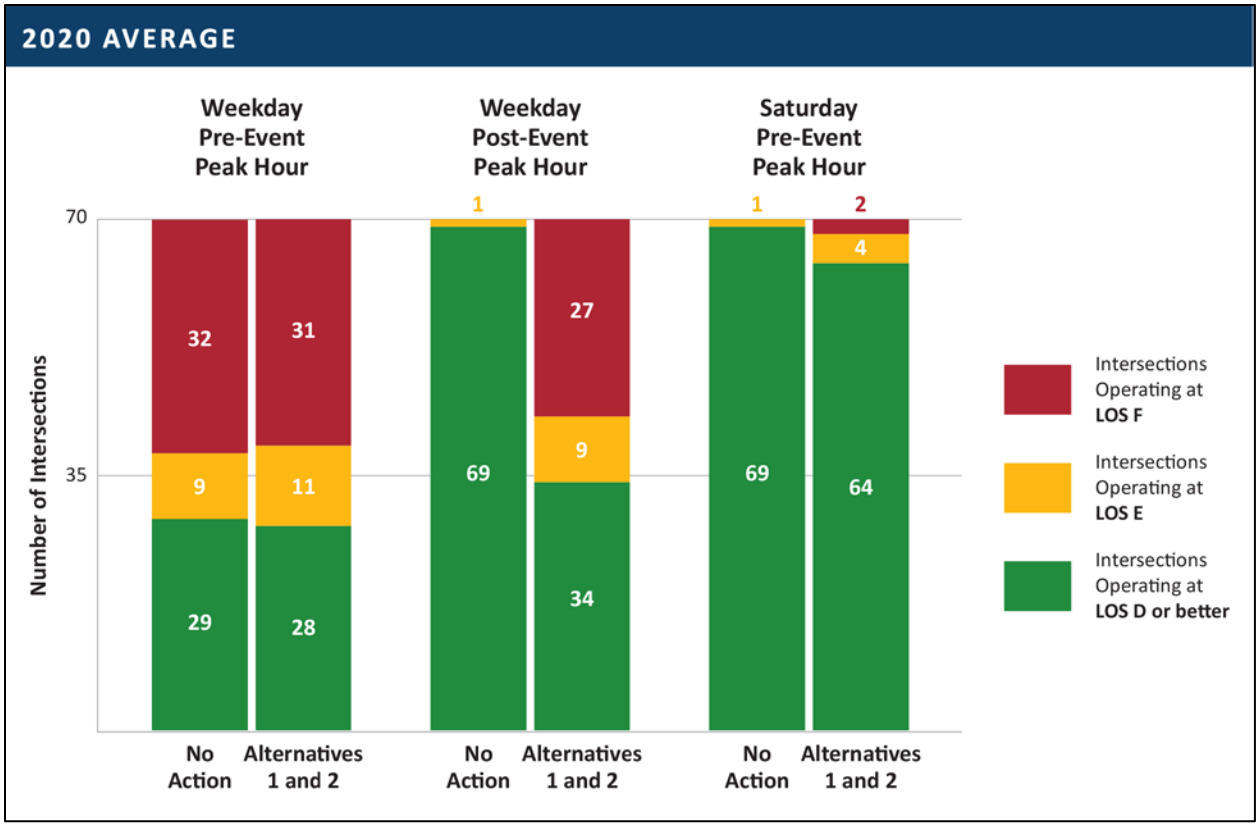


Figure 4-18. Intersection LOS Summary – 2020 Conditions with Average Seattle Center Attendance

During the weekday pre-event peak hour on a day with Average Seattle Center Attendance, 19 intersections would be impacted by the project. For intersections that operate acceptably under the No Action Alternative, this is defined as dropping to an unacceptable LOS (LOS E or F for signalized

intersections and adversely affected unsignalized intersections based on degree of congestion increase, modal conflicts, and other considerations). For intersections that operate unacceptably under the No Action Alternative, this is defined as Alternative 1 adding at least 5 seconds of delay. These impacted intersections are shown in Figure 4-19.

Figure 4-20 shows the directional LOS on segments of Mercer St and Denny Way between Seattle Center and I-5. This figure indicates that Alternative 1 would cause westbound travel on these roadways to experience moderate to substantial delay increases when compared to the No Action Alternative (refer to Figure 4-16 for comparison). Refer to Appendix C, Tech Memo 6, 2020 Analysis Results for Roadway and Pedestrian Systems, for more detail.

The micro-simulation models used to evaluate traffic operations suggest that not all of the travel demand under Alternative 1 could be served on westbound Mercer St and Denny Way due to bottlenecks to the east (principally the I-5 off-ramp merge). Because only a portion of that traffic is expected to be able to travel through those corridors, some intersections may operate slightly better than would otherwise be expected. Conversely, queues would spill back from bottlenecks, affecting the LOS at upstream intersections.

During the weekday pre-event peak hour, traffic exiting I-5 (from the north and south) onto westbound Mercer St would exceed the capacity of the Mercer St/Fairview Ave N intersection, causing traffic to spill back onto the freeway mainline. This is caused primarily by the large influx of project-related vehicle trips. While it is accurate to report that the off-ramps cannot serve the projected demand, it is also true that capacity limitations on I-5 may also constrain travel demand from reaching the off-ramps. (In other words, the significant queues on southbound I-5 north of the Ship Canal and westbound I-90 and SR 520 could limit how many vehicles could arrive at the Mercer Street off-ramps during the pre-event peak hour.)

During the weekday post-event peak hour on a day with Average Seattle Center Attendance, 35 intersections would be impacted under Alternative 1. These impacted intersections are displayed in Figure 4-19. During the Saturday pre-event peak hour on a day with Average Seattle Center Attendance, 4 intersections would be impacted under Alternative 1. The impacted intersections are:

- Mercer St/Dexter Ave N
- Mercer St/Fairview Ave N
- Denny Way/Stewart St
- Roy St/5th Ave N

Table 4-15 summarizes projected travel speeds along Mercer St and Denny Way under Alternative 1 – Average Seattle Center Attendance.

Table 4-15. Corridor Travel Speed – 2020 Alternative 1 – Average Seattle Center Attendance

Corridor	Weekday Pre-Event Peak Hour			
	Eastbound		Westbound	
	Average Travel Speed (MPH)	% of Free Flow Speed	Average Travel Speed	% of Free Flow Speed
Mercer St	2	20%	5	50%
Denny Way	2	20%	5.5	55%

MPH = miles per hour. Average free-flow travel speed of 10 MPH assumed given presence of controls and measured speeds in this range under mostly free-flow conditions on these corridors.

Source: Prepared by Fehr & Peers, 2018.

This table shows the following findings:

- Average travel speeds on eastbound Mercer St between Seattle Center and I-5 would be unchanged relative to the No Action Alternative. Westbound travel speeds on Mercer St would be reduced from 10 MPH under the No Action Alternative to 5 MPH under Alternative 1 – Average Seattle Center Attendance. As noted above, the Mercer St/Fairview Ave N intersection meters the flow of westbound traffic into the corridor, thereby limiting further reductions in travel speed (i.e., vehicles are queued on the I-5 off-ramps).
- On Denny Way, the average eastbound travel speed between Seattle Center and I-5 would be unchanged relative to the No Action Alternative. The westbound travel speed would decrease from 7 MPH under the No Action Alternative to 5.5 MPH under Alternative 1 – Average Seattle Center Attendance.
- As was the case in the No Action Alternative, the fact that the eastbound travel times do not change is more of a reflection of the complete saturation of eastbound lanes due to the bottleneck caused by I-5. Under Alternative 1, the percent demand served is lower than under the No Action Alternative, which indicates that the congested peak period would extend in duration.

This scenario would result in traffic queuing back onto the I-5 freeway mainline from the Mercer St off-ramps.

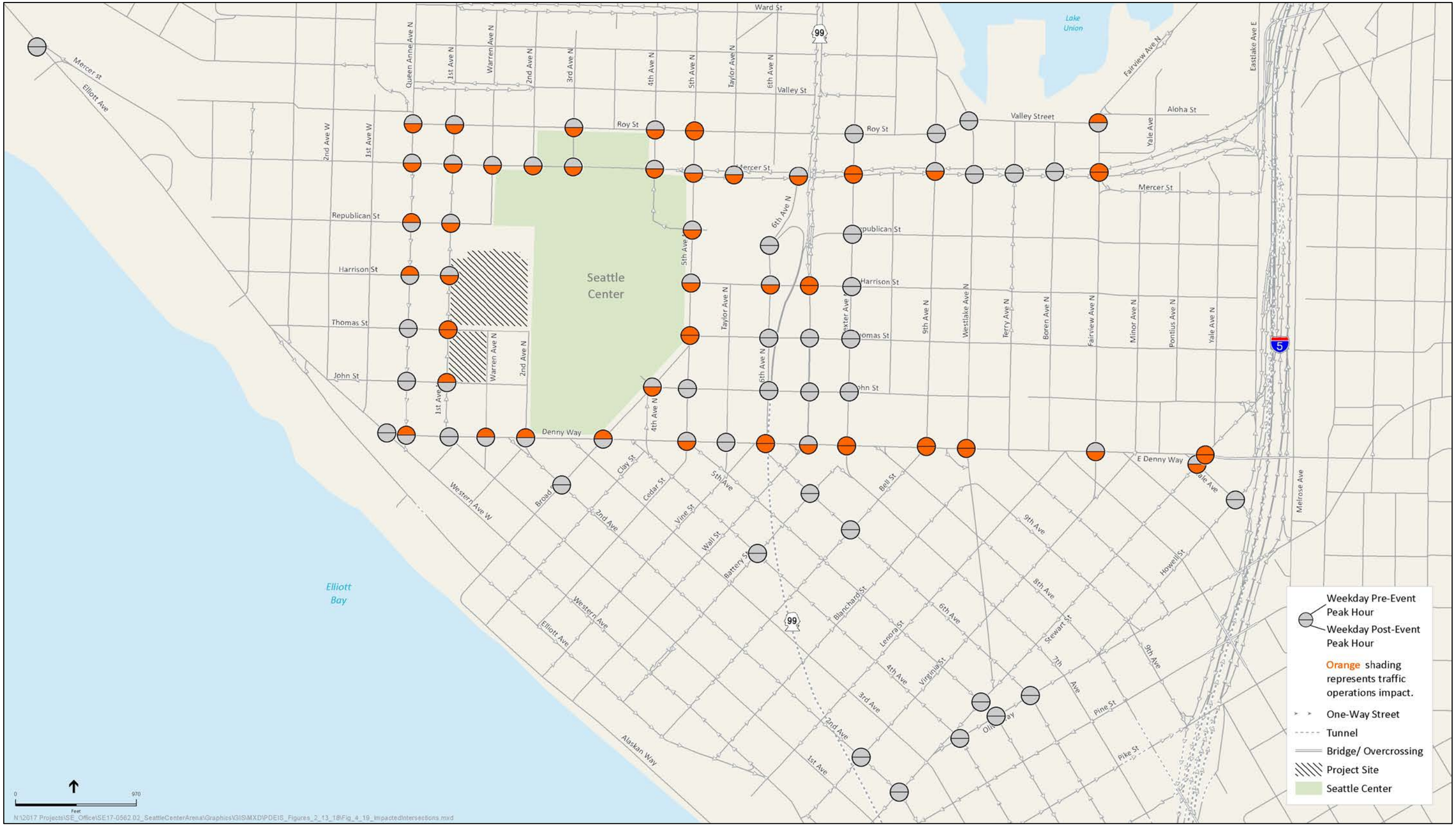


Figure 4-19. Impacted Intersections – 2020 Alternative 1 – Average Seattle Center Attendance Weekday Pre-Event and Post-Event Peak Hour Conditions

Figure 4-20. Directional Level of Service and Travel Time on East/West Roadways – 2020 Alternative 1 – Average Seattle Center Attendance Weekday Pre-Event Peak Hour Conditions

Above-Average Seattle Center Attendance

Figure 4-21 displays intersection LOS for Above-Average Seattle Center Attendance conditions under the No Action Alternative and with Alternative 1. This figure indicates that a greater percentage of intersections would operate at LOS D or better under Alternative 1 than under the No Action Alternative (Alternative 2 operations are described in a subsequent section). This occurs for several reasons. First, the project would add greater amounts of traffic in the non-peak directions of Mercer St and Denny Way. In some instances (e.g., Mercer St/9th Ave N), this causes the weighted average delay for all movements at the intersection to be reduced, thereby causing a better LOS result. Additionally, Alternative 1 causes bottlenecks at certain upstream intersections, thereby causing delays to be reduced at downstream intersections due to fewer approaching vehicles. Despite these findings, a visual inspection of the traffic simulation shows that there is additional traffic congestion under Alternatives 1 and 2 when compared to the No Action condition, consistent with expectations.

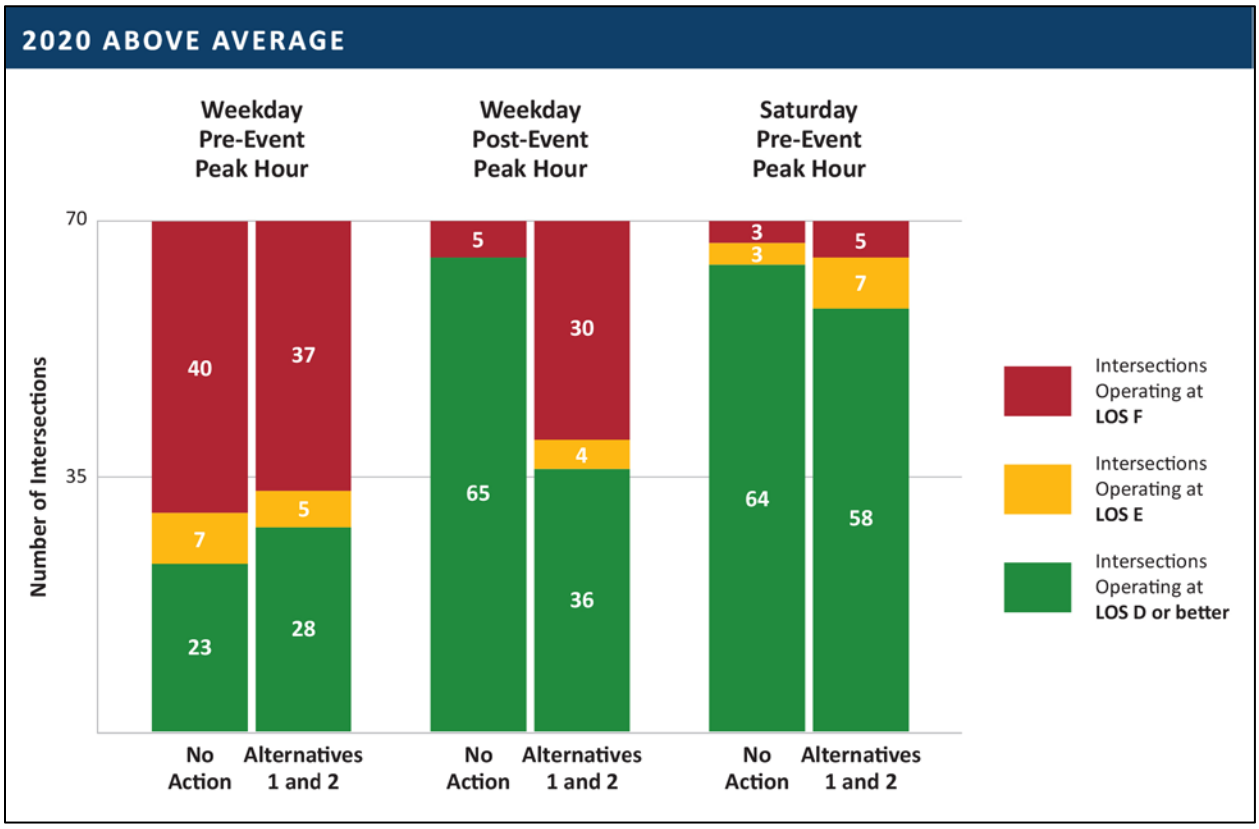


Figure 4-21. Intersection LOS Summary – 2020 Conditions with Above-Average Seattle Center Attendance

During the weekday pre-event peak hour on a day with Above-Average Seattle Center Attendance, 20 intersections would be impacted by the project. For intersections that operate acceptably under the No Action Alternative, this is defined as dropping to an unacceptable LOS (LOS E or F and adding 5 or more seconds of delay for signalized intersections and adversely affected unsignalized intersections based on the degree of congestion increase, modal conflicts, and other considerations). For intersections that operate unacceptably under the No Action Alternative, this is defined as Alternative 1 adding at least 5 seconds of delay. These impacted intersections are displayed in Figure 4-22. During the weekday post-event peak hour on a day with Above-Average Seattle Center Attendance, 33 intersections would be

impacted under Alternative 1 (the No Action Alternative assumes a mid-sized KeyArena event that does not result in widespread poor operations during the post-event peak hour when background traffic is minimal). These impacted intersections are displayed in Figure 4-22. During the Saturday pre-event peak hour on a day with Above-Average Seattle Center Attendance, 7 intersections would be impacted under Alternative 1. The impacted intersections are:

- Mercer St/4th Ave N
- Mercer St/5th Ave N
- Denny Way/Warren Ave N
- Denny Way/Fairview Ave N
- Denny Way/Stewart St
- Roy St/4th Ave N
- Roy St/5th Ave N

Table 4-16 summarizes projected travel speeds along Mercer St and Denny Way under Alternative 1 – Above-Average Seattle Center Attendance. This table indicates that westbound travel speeds on Mercer St would remain similar to the No Action Alternative because the travel speed comparison begins downstream of the Mercer St/Fairview Ave N bottleneck. Hence, the volume served and speed of traffic passing through the corridor under each scenario are similar. Figure 4-23 shows the directional LOS on segments of Mercer St and Denny Way between Seattle Center and I-5.

Table 4-16. Corridor Travel Speed – 2020 Alternative 1 – Above-Average Seattle Center Attendance

Corridor	Eastbound		Westbound	
	Average Travel Speed (MPH)	% of Free Flow Speed	Average Travel Speed	% of Free Flow Speed
Mercer St	2	20%	5	50%
Denny Way	2	20%	4.5	45%

MPH = miles per hour.

Source: Prepared by Fehr & Peers, 2018.

The following conclusions are drawn regarding traffic impacts of Alternative 1 under the Average and Above-Average Seattle Center Attendance scenarios:

Weekday Pre-Event Peak Hour

- Alternative 1 impacts are measured against the No Action Alternative as follows:
    - For Average Seattle Center Attendance conditions, no major event occurs at KeyArena or Seattle Center. Thus, for this scenario, the Alternative 1 impacts are based on the entirety of the project's travel effects.

- For Above-Average Seattle Center Attendance conditions, greater levels of background attendance are assumed at Seattle Center, including an event at KeyArena under the No Action Alternative. Thus, when Alternative 1 conditions are compared against the No Action Alternative, the net increase in overall traffic is less than when comparing the same scenarios under Average Seattle Center Attendance conditions.
- Under both scenarios, conditions along Mercer St and Denny Way are over-saturated, with vehicle queue spillbacks extending onto various north-south streets. The net effect is the same number of impacted intersections caused by Alternative 1 under Average and Above-Average Seattle Center Attendance conditions, although impacts do occur at different locations.

Weekday Post-Event Peak Hour

- The severity of Alternative 1 impacts (roughly half of all intersections are impacted) is similar under Average and Above-Average Seattle Center Attendance conditions because neither assumes an Event TMP. As a result, queue spillbacks occur from multiple intersection bottlenecks, adversely affecting the overall roadway network in a similar manner for each condition.

Saturday Pre-Event Peak Hour

- Alternative 1 causes significant impacts at 7 intersections under the Above-Average Seattle Center Attendance scenario, versus 4 under the Average Attendance scenario.

Ridehailing

Ridehailing vehicles tend to drop off passengers in accordance with their selected destination and often at whatever specific block location the passenger requests. Alternative 1 would not alter this typical drop-off behavior—drop-offs tend to be more dispersed than pick-ups in both time (people stagger their arrival more than their departure) and in space (people drop off at more locations and tend to be picked up near the exit door). However, based on input from SDOT, the City would regulate post-event pick-ups to only occur at a handful of locations surrounding and at the perimeter of the Seattle Center campus.

Under this plan, during pre-determined event times (to be coordinated by Seattle Center and SDOT), a customer requesting a ride from the area bounded by Roy St, Dexter Ave N, Denny Way, and Queen Anne Ave N would have to meet their vehicle at one of the designated pick-up locations during post-event conditions.

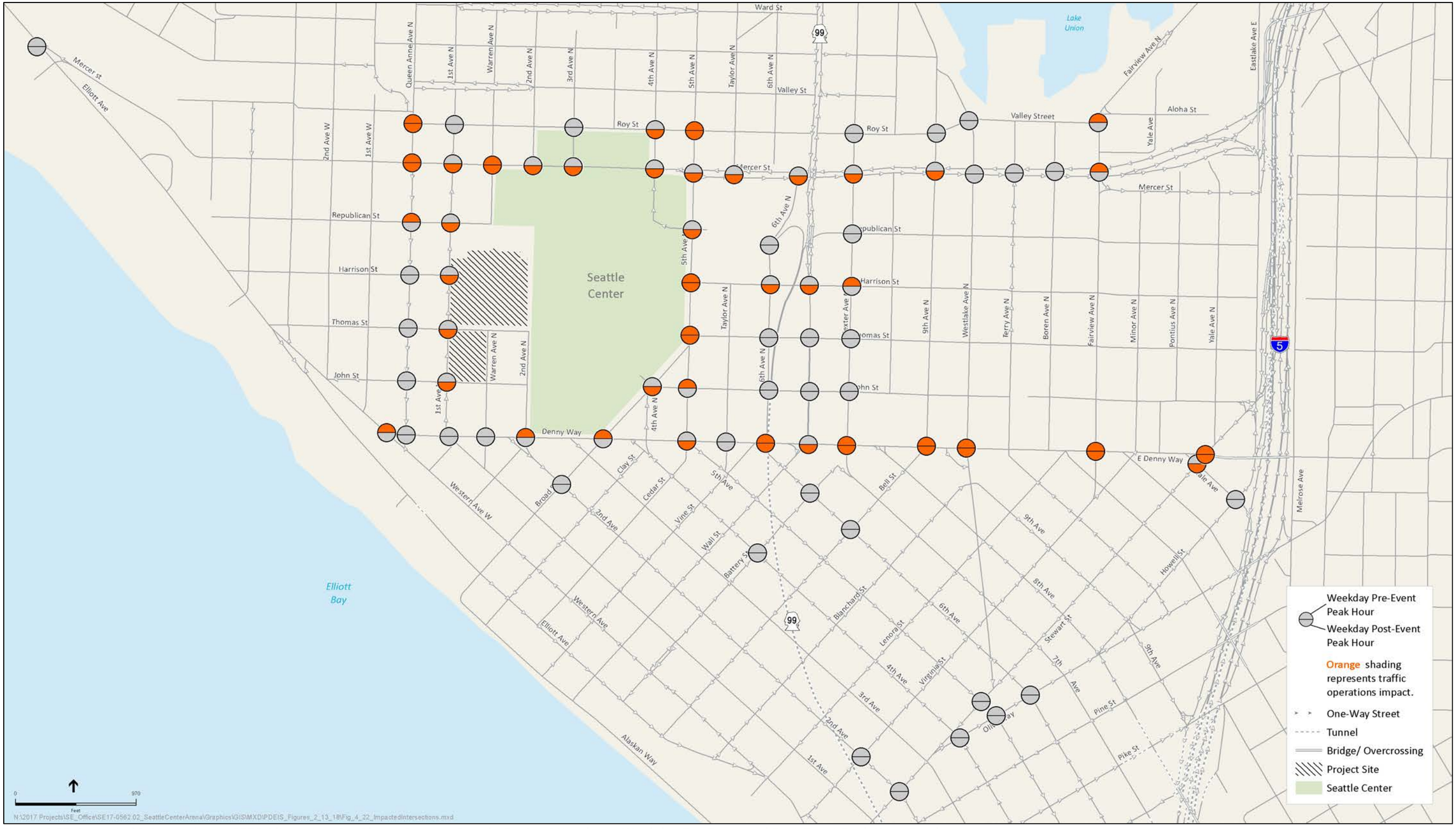


Figure 4-22. Impacted Intersections – 2020 Alternative 1 – Above-Average Seattle Center Attendance Weekday Pre-Event and Post-Event Peak Hour Conditions

Figure 4-23. Directional Level of Service and Travel Time on East/West Roadways – 2020 Alternative 1 – Above-Average Seattle Center Attendance Weekday Pre-Event Peak Hour Conditions

Average Seattle Center Attendance

Under Alternative 1 – Average Seattle Center Attendance, the renovated arena would attract substantial ridehailing activity during events such as an NBA game or concert. Drop-off activity would be similar to that observed during large KeyArena events, which sometimes result in ridehailing vehicles blocking through lanes, bicycle facilities, or bus pullouts, particularly along 1st Ave N between Harrison St and Republican St. Some of the designated ridehailing pick-up locations may temporarily repurpose a parking or travel lane, but this would be in accordance with a TMP in coordination with SDOT to minimize the effects to other modes.

Above-Average Seattle Center Attendance

Under Alternative 1 – Above-Average Seattle Center Attendance, ridehailing would occur within a slightly more congested traffic environment. Drivers may have a more difficult time finding appropriate curb space to drop off passengers, resulting in more frequently blocked through lanes, bicycle facilities, or bus pullouts during the pre-event peak hours, particularly along 1st Ave N between Harrison St and Republican St. Some of the designated ridehailing pick-up locations may temporarily repurpose a parking or travel lane, but this would occur in accordance with a TMP in coordination with SDOT to minimize the effects to other modes.

Transit

Average Seattle Center Attendance

Table 4-17 displays the number of event attendees that are expected to ride a bus directly to the renovated arena during each peak hour under Alternative 1 (i.e., this does not include bus riders who stop at Westlake Station or other locations and then complete their trip to the arena by another mode). This table also shows similar information for Monorail ridership. The following describes the analysis performed for each of these travel modes.

Travel by Bus

A detailed ridership estimate and capacity analysis (by individual route) was conducted for weekday and Saturday conditions. As described in the table footnotes, the analysis concluded that buses with stops at/near Seattle Center have adequate reserve capacity to accommodate the additional riders associated with Alternative 1 during the weekday and Saturday pre-event peak hour.

During the weekday post-event peak hour, the analysis shows that project-related riders would consume approximately half of the reserve capacity. However, demand to travel northbound to the University District and Ballard would exceed the crowding threshold on routes serving these areas. Note that while the majority of the routes would have capacity during the post-event peak hour, some individual trips could reach capacity and turn away riders. A description of Saturday post-event conditions is included in the impact summary section.

Buses would continue to operate on roadways such as Denny Way that are currently congested. Under both pre-event and post-event conditions, 1st Ave N and Queen Anne Ave N between Denny Way and Mercer St are expected to operate under congested conditions. Transit travel time and reliability would be adversely affected under Alternative 1 – Average Seattle Center Attendance during all 3 peak hour analysis periods. Additionally, ridehailing vehicle drop-offs could occasionally block bus stops or layover areas, which could delay bus riders or interfere with transit operations.

Capacity at nearby bus stops was also considered. The northbound stop at 1st Ave N and Republican St is expected to have adequate capacity because riders could spill back into the arena plaza during periods of highest demand. However, the southbound stops along Queen Anne Ave N are more constrained due to sidewalk width and street furniture, particularly at John St and Harrison St. This could lead to riders blocking other pedestrians trying to travel along the sidewalk while waiting for buses during the post-event peak hour.

Travel by Monorail

As shown in the table, Monorail ridership by project attendees would be greatest after an event. During the post-event peak hour, project-related riders could be accommodated via normal service (i.e., 10-minute headways). However, some passengers may have to wait up to 20 minutes due to Monorail train capacity constraints.

Table 4-17. Transit Capacity – 2020 Alternative 1 – Average Seattle Center Attendance

Time Period	Travel by Bus (Directly to/from Arena)		Travel by Monorail (to/from Arena)	
	Number of Arena Attendee Riders [1]	Percent Usage of Overall Reserve Capacity by Arena Attendees [2]	Number of Arena Attendee Riders [1]	Evaluation
Weekday Pre-Event Peak Hour	881	37%	330	Demand can be accommodated by existing service [4]
Weekday Post-Event Peak Hour	1,046	51%	697	
Saturday Pre-Event Peak Hour [3]	574	N/A	191	

1. See Appendix C, Tech Memo 5, Project Travel Characteristics – Year 2020. These totals refer only to added riders that would board or alight at or near Seattle Center (on either bus or Monorail), not total transit usage.

2. To assess usage of individual bus routes that stop at Seattle Center, bus riders were assigned to individual routes based on the relative proportion of bus trips expected to originate/be destined from areas such as Downtown, Uptown/Belltown, Queen Anne, Mercer West, east of I-5, and points to the north that feature direct bus service. Then, additional ridership demand was evaluated against unused seats (in the appropriate travel direction) to determine adequacy of transit capacity.

3. Since bus ridership data were not available for Saturday conditions, this evaluation focused on the relative change in bus service on Saturdays versus weekdays. It was found that Saturday pre-event peak hour service levels (for routes arriving to/near Seattle Center) are about 62% of weekday service levels. Since Saturday pre-event peak hour project attendee ridership is 65% of weekday pre-event peak hour ridership, the proportional scaling back of project ridership and service levels from weekday to Saturday conditions suggests that findings regarding project ridership for weekday pre-event conditions would also apply to Saturday.

4. The Monorail operates on 10-minute headways that can carry 250 persons per train. Under Average Seattle Center Attendance conditions, evening ridership is well below train capacity. The maximum demand for ridership would occur after an event. Assuming 75% of the demand arrives within a 30-minute window, 523 persons would need to be accommodated in 3 trains. In all likelihood, first train would be completely full, second train would be mostly occupied, and third train would be uncrowded.

Source: Prepared by Fehr & Peers, 2018.

Above-Average Seattle Center Attendance

Table 4-18 summarizes the transit capacity findings for Alternative 1 – Above-Average Seattle Center Attendance. Below is a description of the findings for bus and Monorail.

Travel by Bus

The number of bus riders generated by the arena would be the same regardless of the attendance levels on the Seattle Center campus. However, reserve capacity on buses would be lower because some of that space would be occupied by other Seattle Center visitors. The bus riders generated by the arena would take up a larger percentage of the reserve capacity, but could still be accommodated on most routes without overcrowding.

During the weekday post-event peak hour, demand to travel northbound to the University District and Ballard would exceed the crowding threshold on routes serving those areas. While the majority of the routes would have capacity during the post-event peak hour, some individual trips could reach capacity and turn away riders. A description of Saturday post-event conditions is included in the impact summary section.

Buses would operate on congested roadways such as Denny Way, 1st Ave N, and Queen Anne Ave N. Transit travel time and reliability would be adversely affected under Alternative 1 – Above-Average Seattle Center Attendance during all 3 peak hour analysis periods.

As described above, the southbound bus stops along Queen Anne Ave N are somewhat constrained, particularly at John St and Harrison St. This could lead to riders blocking other pedestrians trying to travel along the sidewalk while waiting for buses during the post-event peak hour.

Travel by Monorail

Monorail ridership by project attendees would remain the same under Above-Average Seattle Center Attendance conditions. Although the background reserve capacity would be lower, it is expected that the Monorail could still accommodate all riders over the course of the post-event peak hour. However, some passengers may have to wait up to 20 minutes due to Monorail train capacity constraints.

Table 4-18. Transit Capacity – 2020 Alternative 1 – Above-Average Seattle Center Attendance

Time Period	Travel by Bus (Directly to Arena)		Travel by Monorail (to/from Arena)	
	Number of New Riders [1]	Percent Usage of Overall Reserve Capacity [2]	Number of New Riders [1]	Evaluation
Weekday Pre-Event Peak Hour	881	41%	330	Demand can be accommodated by existing service [4]
Weekday Post-Event Peak Hour	1,046	54%	697	
Saturday Pre-Event Peak Hour[3]	574	N/A	191	

[1,2,3,4] See the notes as presented in Table 4-17.

Source: Prepared by Fehr & Peers, 2018.

Pedestrian Travel

The pedestrian system evaluation focuses on the adequacy of existing facilities to accommodate surges in pedestrians associated with large events. The 6th Edition of the Highway Capacity Manual (HCM) includes a detailed methodology to calculate whether crosswalks and sidewalks can accommodate projected pedestrian flows (Transportation Research Board, 2016). For this study, the metric used to determine facility adequacy is average pedestrian space, which considers average walk speeds, hourly

pedestrian flows, and effective sidewalk width (i.e., the width of the sidewalk that is not obstructed by trees, overhanging vehicles, utility poles, etc.). At signalized crosswalks, it also considers the length of the walk interval, crosswalk width, and signal cycle length. Per HCM recommendations, a threshold of 13 square feet per pedestrian for sidewalks, and 11 square feet per pedestrian for crosswalks is applied as a threshold to determine whether the project may result in pedestrians overflowing onto streets, which can cause conflicts with moving vehicles and other forms of travel. A detailed discussion of this methodology and results is found in Appendix C, Tech Memo 6, 2020 Analysis Results for Roadway and Pedestrian Systems.

Average Seattle Center Attendance

Figures 4-24 and 4-25 display expected pedestrian flows for Alternative 1 – Average Seattle Center Attendance during the weekday pre-event and weekday post-event peak hours, respectively. Results are not shown for Saturday pre-event conditions because a concert would generate fewer peak hour pedestrian trips due to a more uniform arrival pattern when compared to a basketball game (60% of basketball game attendees are expected to arrive during the pre-event peak hour compared to only 50% for a concert; see Appendix C, Tech Memo 5, Project Travel Characteristics – Year 2020). These estimates include pedestrians who walk directly from their origin as well as those who arrive to the study area by another mode, but then walk to the arena from their parked car, ridehailing drop-off, or transit stop. The volumes shown also include background pedestrian activity that is unrelated to the arena. Background activity is lower during the post-event peak hour so some locations would have lower total volumes despite the increase in project pedestrian volumes.

Under Average Seattle Center Attendance conditions, all sidewalks would have sufficient capacity to carry the pedestrian demand without overflow into adjacent streets. The facility nearest the capacity threshold would be 2nd Ave N between John St and Denny Way. Some signalized intersections in the vicinity of the project provide sizeable areas for pedestrians to wait to cross the intersection. Examples exist along portions of 5th Ave N (e.g., at Harrison St). Other intersections have limited size waiting areas to accommodate pedestrians, such as the 1st Ave N/Mercer St and 1st Ave N/Harrison St intersections.

The project site plan shows pedestrian facilities along 1st Ave N and Thomas St, including wide sidewalks with frequent access points to the arena plaza. These facilities would provide more capacity than existing sidewalks, particularly along Thomas St, and would be sufficient to serve the pedestrian demand. Event attendees would walk through Seattle Center from nearly all of its public street access points. These facilities are of substantial width to accommodate large events.

Demand would exceed capacity at 1 crosswalk: the north leg of the 5th Ave N/Harrison St intersection. This crosswalk is projected to accommodate 1,150 pre-event peak hour pedestrians and 2,100 post-event peak hour pedestrians. The high pedestrian flows are due to the crosswalk's proximity to the 5th Ave N Garage as well as its usage to travel from the project site (through Seattle Center) east along Harrison St to new parking garages on Dexter Ave N. Several other crosswalks would have volumes nearing capacity, but would typically not result in pedestrians walking outside of crosswalks (although they may feel very crowded). Increased demand across 1st Ave N is expected at the unmarked, unsignalized crossings at Thomas St and John St.

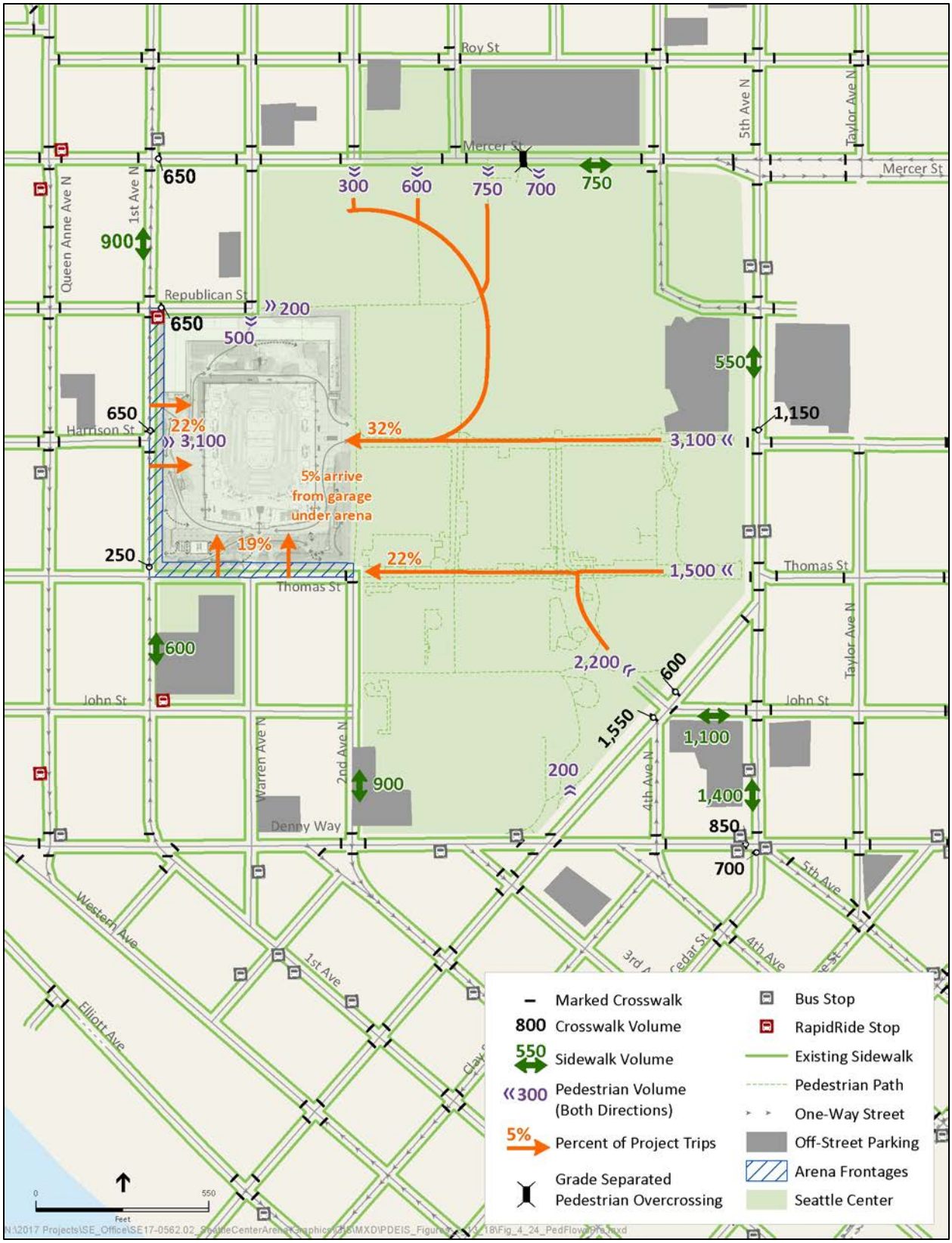


Figure 4-24. Pedestrian Flows – 2020 Alternative 1 – Average Seattle Center Attendance Weekday Pre-Event Peak Hour Conditions

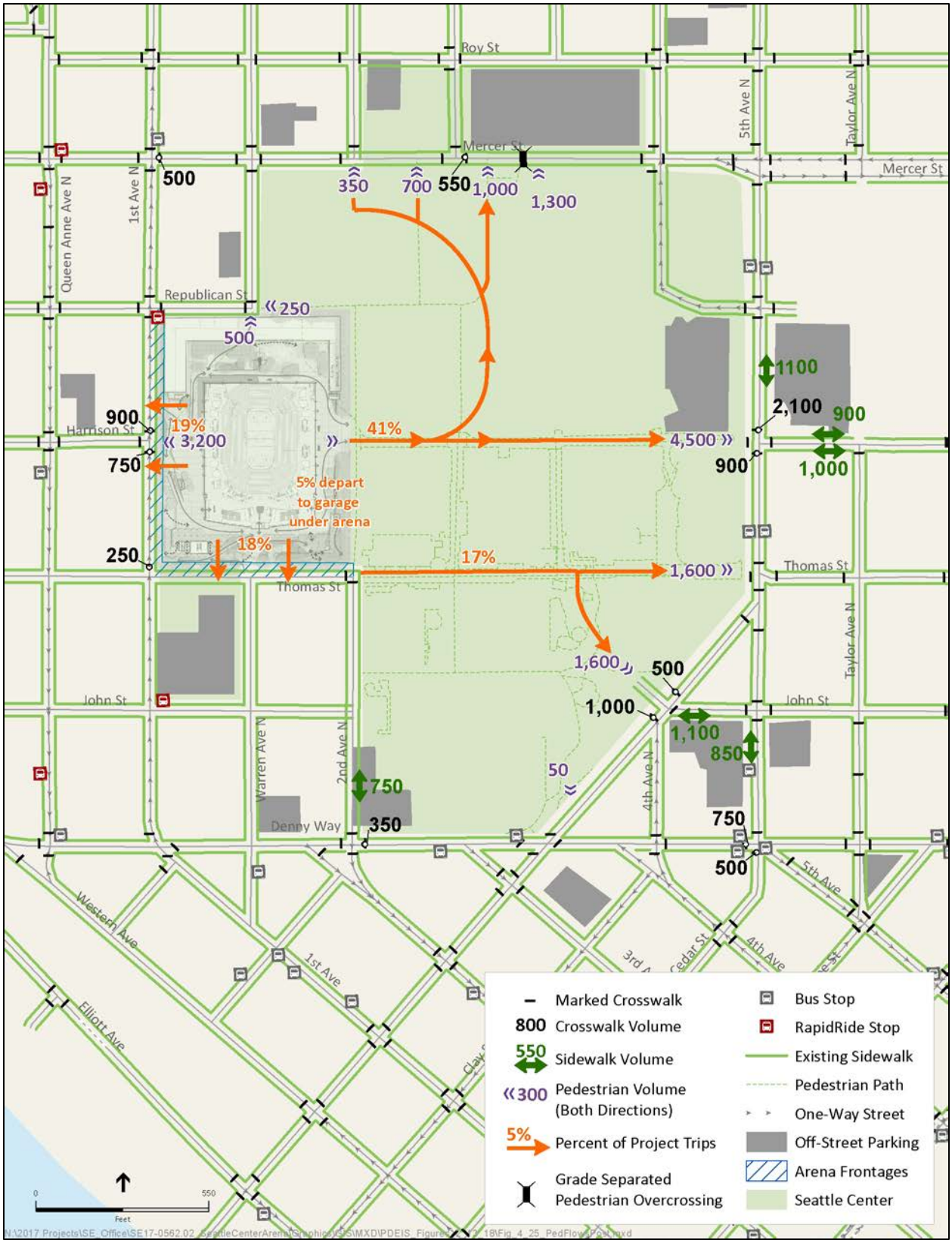


Figure 4-25. Pedestrian Flows – 2020 Alternative 1 – Average Seattle Center Attendance Weekday Post-Event Peak Hour Conditions

Above-Average Seattle Center Attendance

Under Above-Average Seattle Center Attendance conditions, the majority of the added pedestrian travel (beyond Average Seattle Center Attendance conditions) would occur between the Mercer St, 1st Ave N, and 5th Ave N garages and Seattle Center venues east of the arena. Few additional sidewalks and crosswalks would be affected by a direct trip between these parking facilities and the arena. In other words, the sidewalks and crosswalks between these parking facilities and the Seattle Center venues tend to have capacity, with the exception of the 5th Ave N/Harrison St north leg crosswalk, which would be further impacted by people parking east of Seattle Center and traveling to campus venues. Attendees who visit nearby restaurants may result in additional sidewalk/crosswalk use, but this travel would not result in sidewalks/crosswalks exceeding capacity.

Although some crosswalks do not have capacity constraints from a pedestrian demand perspective, they would cause operational issues in which the flow of vehicular traffic is restricted by frequent pedestrian crossings. Some examples include crosswalks along the north side of Denny Way between 1st Ave N and 2nd Ave N, and the east side crosswalk at the Mercer St/3rd Ave N intersection. These pedestrian flow impacts to traffic operations are integrated into the results presented earlier.

Bicycle Travel

Assuming a 1% mode share for event attendees, the site should provide parking for roughly 190 bicycles. The project site plan does not show any on-site short-term or long-term bicycle parking spaces. Additionally, there are no current plans for a bicycle valet program.

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions, vehicles (ridehailing or otherwise) could temporarily block bicycle facilities when dropping off passengers during the pre-event peak hours. While temporary, the blockage would create a challenging environment for bicyclists who must pull into a vehicle lane to move around a stopped vehicle blocking the bicycle facility. Post-event blockages are unlikely to occur because SDOT would designate ridehailing pick-up locations such that they would not routinely interfere with bicycle facilities.

Above-Average Seattle Center Attendance

With Above-Average Attendance on the Seattle Center campus, including an event at the arena, vehicles (ridehailing or otherwise) could temporarily block bicycle facilities when dropping off passengers during the pre-event peak hours. This would likely be more frequent given the increased congestion during an Above-Average Seattle Center Attendance condition. While temporary, this blockage would create a challenging environment for bicyclists that must pull into a vehicle lane to move around a stopped vehicle blocking the bicycle facility. Post-event blockages are unlikely to occur because SDOT would designate ridehailing pick-up locations such that they would not routinely interfere with bicycle facilities.

Parking

Vehicle trips generated by the renovated arena were assigned to on-street and off-street parking locations that are currently anticipated to be available for public parking. This includes 510 employees of the arena who are expected to arrive primarily by private vehicle. Locations were selected based on the origin/destination of the trip; for example, a trip arriving via I-5 is likely to park to the east of the arena while a trip arriving via Elliott Ave is expected to park to the west of the arena.

Average Seattle Center Attendance

Table 4-19 summarizes parking occupancy under Alternative 1 – Average Seattle Center Attendance. Total on-street parking occupancy is expected to be 88% on a weekday and 94% on a Saturday. Total off-street parking occupancy is expected to be 79% on a weekday and 91% on a Saturday. Since no formal wayfinding program or parking reservation system is currently proposed, Alternative 1 would most likely result in occupancies on both weekdays and Saturdays that cause a substantial number of vehicles to circulate for multiple blocks looking for parking and increasing conflicts with other modes. Because paid parking and time limits are not in effect on Sundays, on-street parking occupancies would likely be higher than reflected for weekdays and Saturdays.

Table 4-19. Parking Occupancy – 2020 Alternative 1 – Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	98 (93%)	99 (94%)
	North	1,315 (88%)	1,426 (96%)
	South	897 (85%)	958 (91%)
	West	448 (93%)	450 (94%)
	Subtotal	**2,758 (88%)**	**2,933 (94%)**
Off-Street	East	1,508 (69%)	1,959 (90%)
	North	1,177 (85%)	1,308 (95%)
	South	1,620 (86%)	1,724 (91%)
	West	76 (79%)	75 (78%)
	Subtotal	**4,381 (79%)**	**5,066 (91%)**
On-Street & Off-Street	**Total**	**7,139 (82%)**	**7,999 (92%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Refer to Figure 4-11 for each geographic parking subarea. Includes the 450-space garage beneath the renovated arena.
Source: Prepared by Fehr & Peers, 2018.

Above-Average Seattle Center Attendance

Table 4-20 summarizes parking occupancy with Above-Average Seattle Center Attendance conditions. Under Alternative 1 on a weekday, Above-Average Seattle Center Attendance would result in roughly 800 more vehicles parking within the study area than with Average Seattle Center Attendance. On a Saturday, the increase is approximately 300; this smaller increase reflects that less parking is available on a Saturday in the study area so more visitors would park in more remote locations, such as along Dexter Ave N, South Lake Union, or Westlake Center parking facilities.

Total on-street parking occupancy is expected to be 91% on a weekday and 94% on a Saturday. Total off-street parking occupancy is expected to be 91% on a weekday and 96% on a Saturday. Again, lacking any formal wayfinding program or parking reservation system, Alternative 1 would most likely result in occupancies on both weekdays and Saturdays that cause a substantial number of vehicles to circulate for multiple blocks looking for parking and increasing conflicts with other modes. Because paid parking

and time limits are not in effect on Sundays, on-street parking occupancies would likely be higher than reflected for weekdays and Saturdays.

The Above-Average Seattle Center Attendance scenario reflects a situation in which there are multiple events occurring on campus of varying size and timing. Visitors arriving for an earlier event would be more likely to find parking at the most convenient lots, while those arriving for a later event may find those lots full. Because of the dynamic nature of event scheduling at Seattle Center, this would affect venues differently depending on the other events on campus on any particular day.

Table 4-20. Parking Occupancy – 2020 Alternative 1 – Above-Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	98 (93%)	99 (94%)
	North	1,365 (92%)	1,416 (95%)
	South	947 90%)	978 (93%)
	West	448 (93%)	450 (94%)
	Subtotal	**2,858 (91%)**	**2,943 (94%)**
Off-Street	East	1,888 (86%)	2,096 (96%)
	North	1,308 (95%)	1,308 (95%)
	South	1,792 (95%)	1,851 (98%)
	West	86 (90%)	92 (96%)
	Subtotal	**5,074 (91%)**	**5,347 (96%)**
On-Street & Off-Street	**Total**	**7,932 (91%)**	**8,290 (96%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Refer to Figure 4-11 for each geographic parking subarea. Includes the 450-space garage beneath the renovated arena.
Source: Prepared by Fehr & Peers, 2018.

Bus/Truck Staging

Charter buses and trucks currently stage using curb space in the vicinity of the project site in accordance with the SDOT and Seattle Center MOA for Event Curbside Management (2011). Through that agreement, Seattle Center reserves curb space for loading, unloading, and staging of events on Thomas St, Warren Ave N, 2nd Ave N, Republican St, 4th Ave N, and Roy St. While most of those locations would remain available with a renovated arena, charter buses would not be staged on Thomas St due to the new south plaza and underground parking garage entrance on Thomas St. Alternative 1 has additional underground truck/bus storage compared to the space available south of KeyArena today. However, given the larger (both in terms of attendance and on-stage equipment) shows that would be accommodated by the renovated arena, it is likely that on-street staging would still be required. Seattle Center and SDOT would likely modify the MOA to include other nearby locations for staging with a similar permitting process as is currently used, such that enough staging space is available whether Seattle Center is operating at an average or above-average attendance level. This process would likely be part of a broader review of curb space management in the area by SDOT. Renegotiation of the MOA could affect on-street parking supply if curb space currently used for general on-street parking is regularly reserved for event staging.

Paratransit

Under Alternative 1, it is expected that paratransit vehicles would continue to load and unload along the east side of 1st Ave N adjacent to the arena as well as on 2nd Ave N just south of KeyArena. This designated passenger loading/unloading curb space would be available under both the average and above-average conditions. Although ridehailing pick-ups would be regulated, drop-offs during the pre-event peak hours would remain unregulated. Based on observations of current drop-off activity at KeyArena, passenger loading/unloading space used by paratransit would sometimes be blocked by non-transit vehicles during periods of high demand, such as drop-offs before an event at the renovated arena.

Safety

No study intersections are currently identified as high collision locations. Under both Average and Above-Average Seattle Center Attendance conditions, bicycle safety may be affected by vehicles (ridehailing or otherwise) temporarily blocking bicycle facilities when dropping off passengers during the pre-event peak hour. Pedestrian safety could be affected at the 5th Ave N/Harrison St crosswalk where pedestrians may spill out of the crosswalk into vehicle lanes to cross the street.

Summary of Transportation Impacts in 2020 – Alternative 1

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions, Alternative 1 would result in adverse impacts when compared to the No Action Alternative. This comparison reflects how the transportation system would be affected on a day without a KeyArena event versus a day with a sold-out event at the renovated arena. Alternative 1 would cause significant impacts at 19 intersections during the weekday pre-event peak hour, 35 intersections during the weekday post-event peak hour, and 4 intersections during the Saturday pre-event peak hour. During the weekday pre-event peak hour, the average travel speed on westbound Mercer St from Fairview Ave N to Seattle Center would be reduced from 10 MPH (under No Action Alternative) to 5 MPH (under Alternative 1). Although this is not classified as a significant impact, the additional delays would be noticeable to westbound motorists. Alternative 1 would also cause traffic exiting both directions of I-5 at Mercer St to queue back toward the mainline.

Transit would experience significant impacts due to overcapacity conditions on some routes, as well as travel time and reliability degradation associated with degraded traffic operations. Because ridehailing vehicles would not have regulated unloading locations during the pre-event peak hours, they would sometimes block through lanes, bicycle facilities, and bus pullouts, resulting in significant impacts to transit, bicycle travel, and safety. No significant impacts related to ridehailing are expected during the post-event peak hours.

Significant pedestrian impacts are expected at the 5th Ave N/Harrison St crosswalk due to high demand.

Parking occupancy levels on weekdays and Saturdays suggest that a substantial number of motorists could circulate for multiple blocks looking for parking. This would increase conflicts with other modes, thereby causing a significant impact. Because paid parking and time limits are not in effect on Sundays, parking impacts are also expected on Sundays.

Above-Average Seattle Center Attendance

With Above-Average Seattle Center Attendance conditions, traffic operations would be congested under both the No Action Alternative and Alternative 1, although Alternative 1 would result in additional

delays on key corridors and intersections. This comparison reflects how the transportation system would change from a high activity day at Seattle Center including a KeyArena event to a high activity day at Seattle Center with a sold-out event at the renovated arena.

The impacts described for the Average Seattle Center Attendance scenario would be exacerbated under the Above-Average Seattle Center Attendance scenario. Alternative 1 would cause significant impacts at 20 intersections during the weekday pre-event peak hour, 32 intersections during the weekday post-event peak hour, and 7 intersections during the Saturday pre-event peak hour. During the weekday pre-event peak hour, the average travel speed on westbound Denny Way from Fairview Ave N to Taylor Ave would be reduced from 7.5 MPH (under No Action Alternative) to 4.5 MPH (under Alternative 1). Although this is not classified as a significant impact, the additional delays would be noticeable to westbound motorists. Alternative 1 would also cause traffic exiting both directions of I-5 at Mercer St to queue back toward the mainline. Transit is expected to experience significant impacts due to overcapacity conditions on some routes, as well as travel time and reliability degradation associated with the traffic operations findings.

Compared to the No Action Alternative, Alternative 1 – Above-Average Seattle Center Attendance would improve the weekday post-event condition related to ridehailing, bicycle travel, and paratransit. However, significant impacts are still expected during the pre-event peak hours because ridehailing vehicles would not have regulated unloading locations. Significant pedestrian impacts are expected at the 5th Ave N/Harrison St crosswalk due to high demand. Lastly, Alternative 1 would result in parking impacts to both on-street and off-street parking that would not occur under the No Action Alternative.

Saturday post-event conditions were also considered although not analyzed for all modes because conditions would be similar to weekday post-event conditions. The exception would be transit, which includes lower service levels for some routes on the weekends. The combined transit capacity of routes during the Saturday post-event peak hour serving the project site is 85% of the weekday post-event peak hour. Frequencies of the routes with potential overcrowding (to the University District and Ballard) are the same between the weekday and Saturday post-event peak hours so no additional crowding impacts on those routes are expected. No additional impacts are expected on routes serving the renovated arena during the Saturday post-event peak hour even with reduced weekend capacity.

Alternative 2: Modified Proposal

This section describes the potential impacts to transportation that would likely occur under Alternative 2. The transportation-related assumptions for Alternative 2 differ from Alternative 1 in the following key ways:

- Less underground parking (200 spaces instead of 450 spaces) beneath the arena.
- Parking before, during, and after events at the 1st Ave N Garage would be capped at 400 spaces.
- Thomas St between 1st Ave N and Warren Ave N would function as a “woonerf” (a street with a raised street-bed where pedestrians and bicyclists have priority over motorists), or urban curbless street as defined in the City’s Right-of-Way Improvements Manual (City of Seattle, 2018), and would be closed to traffic before, during, and after events.
- Ridehailing would be regulated such that no pick-ups may occur after events within the area bounded by (and including) Roy St, Dexter Ave N, Denny Way, and Queen Anne Ave N. No regulation of drop-offs would occur.

The travel characteristics (mode share, origin/destination, etc.) of attendees at the renovated arena under Alternative 2 would be the same as under Alternative 1 given their similar proposed transportation conditions and the fact that the arena capacity is the same.

Traffic Operations

Traffic volume forecasts for Alternative 2 would be similar to Alternative 1. The differences are focused on the locations where parking would be limited: the garage beneath the arena and the 1st Ave N Garage. Because less parking would be provided in those garages compared to Alternative 1, less traffic is projected in the area immediately south of the arena under Alternative 2. However, volumes along the key corridors accessing the arena would be equivalent to Alternative 1. The ridehailing regulations would also disperse some traffic from the area immediately surrounding the arena to other nearby corridors during post-event conditions.

Average Seattle Center Attendance

The traffic operations findings for Alternative 2 are similar to Alternative 1 in most locations. However, by providing fewer parking spaces south of the arena, the amount of time to empty garages/streets in this area after events would be reduced. While there would be a modest traffic increase on other streets associated with this displaced parking (largely expected to be east or south of Seattle Center), this would most likely occur a considerable distance from the site where parking is available and congestion is less severe. Similarly, traffic volumes associated with ridehailing activity would be shifted to areas outside the ridehailing pick-up boundary. Therefore, Alternative 2 is expected to result in a slight improvement (relative to Alternative 1) in traffic conditions at intersections adjacent to and south of the arena. However, the intersection LOS degradations identified under Alternative 1 would also occur at most locations with Alternative 2 given their similar travel characteristics. Similarly, Alternative 2 would result in comparable degradations in travel times and freeway off-ramp queues as described for Alternative 1.

Above-Average Seattle Center Attendance

Under Alternative 2 – Above-Average Seattle Center Attendance, conclusions regarding traffic operations would be similar to those described for the Average Seattle Center Attendance condition. However, Alternative 2 would offer some beneficial circulation effects during the post-event condition because traffic would be more dispersed due to the adjacent parking garage capacity limits and restrictions on post-event passenger pick-ups near the arena.

Ridehailing

Under Alternative 2, ridehailing drop-offs would occur in those locations most convenient to drivers and passengers rather than in a designated area. However, pick-ups would be regulated using a “geofence,” which is a virtual geographic boundary. Customers that request a pick-up while in the geofence would be limited in where they can meet their car. During pre-determined event times (to be coordinated by Seattle Center and SDOT), a customer requesting a ride from the area bounded by Roy St, Dexter Ave N, Denny Way, and Queen Anne Ave N would have to meet their vehicle outside of that restricted area (i.e., pick-ups could not occur on or within those “boundary” streets). This approach would reduce the amount of vehicle traffic in the immediate vicinity of the project site and Seattle Center relative to Alternative 1.

Average Seattle Center Attendance

Under Alternative 2 – Average Seattle Center Attendance, the renovated arena would draw substantial ridehailing activity during events such as an NBA game or concert. Drop-off activity would be similar to that observed during large KeyArena events, which sometimes results in ridehailing vehicles blocking through lanes, bicycle facilities, or bus pullouts, particularly on 1st Ave N between Thomas St and Republican St. Although ridehailing pick-up locations would not be allowed within the geofence, those ridehailing vehicles may stop in travel lanes, bicycle facilities, or bus pullouts outside that area, causing congestion and blockages to other modes. While ridehailing activity would likely be shifted in all directions, most is expected to shift to the west where the ridehailing boundary is closest to the arena.

Above-Average Seattle Center Attendance

Under Alternative 2 – Above-Average Seattle Center Attendance, ridehailing would occur within a slightly more congested traffic environment. However, findings would be similar to those described for the Average Seattle Center Attendance scenario.

Transit

The transit impact findings described for Alternative 1 are also representative of conditions for Alternative 2.

Pedestrian Travel

Alternative 2 would include a woonerf, or urban curbless street, along Thomas St between 1st Ave N and Warren Ave N that would be closed to vehicle traffic before, during, and after events. This street design would make crossing Thomas St more comfortable for pedestrians due to the decreased conflicts with vehicles.

Alternative 2 would limit the parking capacity at the 1st Ave N Garage to 400 spaces and the capacity in the underground garage to 200 spaces. Therefore, Alternative 2 would result in more dispersed parking (relative to Alternative 1), primarily in areas east and south of the arena. This would require attendees to walk longer distances to reach the arena and increase pedestrian flows on some sidewalks and crosswalks. However, the overall change in volume at any 1 facility is expected to be modest given the large number of alternative parking areas, and therefore the pedestrian impacts described for Alternative 1 are representative of conditions under Alternative 2.

Bicycle Travel

As described above, Alternative 2 would make crossing Thomas St more comfortable for bicyclists due to decreased conflicts with vehicles. Aside from this benefit, the bicycle impact findings described for Alternative 1 are representative of conditions for Alternative 2.

Parking

Alternative 2 would limit the parking capacity at the 1st Ave N Garage to 400 spaces and the capacity in the underground garage to 200 spaces. Therefore, under Alternative 2 more than 400 vehicles would need to park in a different location than under Alternative 1. This section presents parking occupancy tables reflecting that change.

Average Seattle Center Attendance

Table 4-21 summarizes parking occupancy under Alternative 2 – Average Seattle Center Attendance. Total on-street parking occupancy is expected to be the same as Alternative 1. Total off-street parking occupancy is expected to be 86% on a weekday and 94% on a Saturday. This assumes that some vehicles that would park within the parking study area under Alternative 1 would find parking outside that area under Alternative 2, particularly on a Saturday evening when off-street occupancy is higher. Because paid parking and time limits are not in effect on Sundays, on-street parking occupancies would likely be higher than reflected for weekdays and Saturdays.

Table 4-21. Parking Occupancy – 2020 Alternative 2 – Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	98 (93%)	99 (94%)
	North	1,315 (88%)	1,426 (96%)
	South	897 (85%)	958 (91%)
	West	448 (93%)	450 (94%)
	Subtotal	**2,758 (88%)**	**2,933 (94%)**
Off-Street	East	1,708 (78%)	2,015 (92%)
	North	1,292 (94%)	1,308 (95%)
	South	1,305 (92%)	1,343 (94%)
	West	76 (79%)	85 (89%)
	Subtotal	**4,381 (86%)**	**4,751 (94%)**
On-Street & Off-Street	**Total**	**7,139 (87%)**	**7,684 (94%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Includes the 200-space garage beneath the renovated arena.
Source: Prepared by Fehr & Peers, 2018.

Above-Average Seattle Center Attendance

Table 4-22 summarizes parking occupancy under Alternative 2 – Above-Average Seattle Center Attendance. Total on-street parking occupancy is expected to be the same as Alternative 1. Total off-street parking occupancy is expected to be 95% on a weekday and 96% on a Saturday. Under Above-Average Seattle Center Attendance conditions, the majority of displaced vehicles (relative to Alternative 1) would find parking outside the study area. Because paid parking and time limits are not in effect on Sundays, on-street parking occupancies would likely be higher than reflected for weekdays and Saturdays.

Table 4-22. Parking Occupancy – 2020 Alternative 2 – Above-Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	98 (93%)	99 (94%)
	North	1,365 (92%)	1,416 (95%)
	South	947 90%)	978 (93%)
	West	448 (93%)	450 (94%)
	Subtotal	**2,858 (91%)**	**2,943 (94%)**
Off-Street	East	2,074 (95%)	2,096 (96%)
	North	1,308 (95%)	1,308 (95%)
	South	1,356 (95%)	1,375 (97%)
	West	86 (90%)	90 (94%)
	Subtotal	**4,824 (95%)**	**4,869 (96%)**
On-Street & Off-Street	**Total**	**7,682 (94%)**	**7,812 (95%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Includes the 200-space garage beneath the renovated arena.
Source: Prepared by Fehr & Peers, 2018.

Bus/Truck Staging

The charter bus and truck staging impact findings described for Alternative 1 are also representative of conditions for Alternative 2.

Paratransit

The paratransit impact findings described for Alternative 1 are also representative of conditions for Alternative 2.

Safety

The safety impact findings described under Alternative 1 are also representative of conditions for Alternative 2.

Summary of Transportation Impacts in 2020 – Alternative 2

Impacts to the transportation system under Alternative 2 would generally be similar to those identified for Alternative 1. The differences relate to traffic operations, ridehailing, and on-street and off-street parking. Due to more dispersed traffic caused by limiting off-street parking availability south of the arena and the ridehailing regulations, there would be fewer and/or less severe impacts at locations immediately surrounding the arena, particularly on the south side. The significant impact findings described under Alternative 1 related to ridehailing during the pre-event peak hours are also representative of conditions under Alternative 2. During the post-event peak hours, the ridehailing activity would shift to nearby corridors, where impacts could occur during the post-event peak hours due to blockages of travel lanes, bicycle facilities, and/or bus pullouts. However, because the blockages would be temporary and considerably more dispersed compared to an unregulated condition, these impacts are not considered significant.

The decreased off-street parking supply immediately south of the arena would result in more competition for on-street and off-street parking, with some patrons having to park farther from the arena. Parking occupancy levels on weekdays and Saturdays suggest that a substantial number of vehicles would circulate for multiple blocks looking for parking and increasing conflicts with other modes; this would be a significant impact. Because paid parking and time limits are not in effect on Sundays, parking impacts are also expected on Sundays.

Frequency of Events

The preceding analysis focuses on the magnitude of impacts that could occur during typical weekday and Saturday evening periods associated with sold-out events held at a renovated arena. The frequency of these conditions is also an important factor when considering the overall impact to the transportation system. Under the No Action Alternative, KeyArena would have roughly 102 events per year, or 2 to 3 per week. Under Alternatives 1 and 2, the frequency of arena events would increase to between 242 and 257 per year, or roughly 4 to 5 times per week. Events such as family shows, community events, WNBA, and other types of smaller sporting events are expected to stay constant among the alternatives. The increase in event frequency would be primarily due to NBA and NHL games (roughly 50 each per year) and large concerts, which are expected to increase from 25 per year under the No Action Alternative to between 40 and 55 under Alternatives 1 and 2. Therefore, the impacts described in this chapter relating to large events at the project site would be more frequent (i.e., twice as often over the course of a year) under Alternatives 1 and 2 than under the No Action Alternative. Moreover, with the increase in arena events, there would be more days of the year when an arena event coincides with another large event on the Seattle Center campus.

Summary of Significant Impacts in 2020 by Alternative

The following table summarizes the significant impacts identified for Alternatives 1 and 2.

Table 4-23. 2020 Summary of Significant Impacts by Alternative

Mode	No Action Conditions	Significant Impacts	
		Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Traffic Operations	LOS E/F intersections: • *Average Seattle Center Attendance*: 41 weekday pre-event, 1 weekday post-event, and 1 Saturday pre-event. • *Above-Average Seattle Center Attendance*: 47 weekday pre-*event*, 5 weekday post-event, and 6 Saturday pre-event. Slow eastbound speeds on Mercer St and Denny Way.	Impacted intersections: • *Average Seattle Center Attendance:* 19 weekday pre-event, 35 weekday post-event, and 4 Saturday pre-event. • *Above-Average Seattle Center Attendance:* 20 weekday pre-event, 33 weekday post-event, and 7 Saturday pre-event. Queues spill back onto I-5 mainline at Mercer St.	Modestly improved traffic operations adjacent to arena because of dispersal of traffic volumes due to off-street parking limits. Same as Alternative 1 beyond arena site.
Ridehailing	Unregulated pick-up/drop-off system may cause	Impacts to transit, bicycles, and safety before events due to the	Impacts to transit, bicycles, and safety before events due

Mode	No Action Conditions	Significant Impacts	
		Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
	blockages before and after large events.	potential of unregulated drop-offs that block facilities. No impacts and improved conditions after events due to designated pick-up locations.	to the potential of unregulated drop-offs that block facilities. No impacts after events because activity is dispersed from arena.
Transit	Transit speed and reliability affected by unacceptable traffic operations and ridehailing pick-up/drop-off activities. Sufficient total bus capacity although many routes have standing room only. Ample Monorail capacity. Occasional transit blockages by ridehailing vehicles.	Transit speed and reliability impacted by poor traffic operations and ridehailing drop-off activities. Crowding impacts on buses to U District and Ballard. Bus stop blockage impact from ridehailing before events; improved conditions after events (see ridehailing section).	Same as Alternative 1.
Pedestrian	Generally acceptable with occasional capacity issues during large events.	Impact at 5th Ave N/Harrison St crosswalk.	Impact at 5th Ave N/Harrison St crosswalk. More comfortable to cross Thomas St due to woonerf.
Bicycle	Occasional blockages caused by ridehailing vehicles during large events.	Bicycle lane blockage impact from ridehailing before events; improved conditions after events (see ridehailing section).	Impact from ridehailing before events; improved conditions after events (see ridehailing section). More comfortable to cross Thomas St due to woonerf.
Parking	Overall sufficient capacity with higher on-street occupancies than off-street occupancies.	Impacts due to modal conflicts caused by motorists circulating for parking (high occupancy levels would cause more cruising for parking).	Same as Alternative 1.
Charter Bus/ Truck Staging	Accommodated via Curbside Management MOA.	No significant impacts.	No significant impacts.
Paratransit	Accommodated in existing passenger loading zones.	No significant impacts, although ridehailing could cause delays in curb space availability in the pre-event period.	Same as Alternative 1.
Safety	Occasional, temporary effects from ridehailing vehicles.	Modal conflict impact from ridehailing before events; improved conditions after events (see ridehailing section).	Same as Alternative 1.

2035 Impacts

The roadway network in place in 2035 is expected to be very similar to 2020. However, the expansion of the LINK light rail system would have a major effect on how people travel within the region. By 2035, Sound Transit LINK light rail service is to be extended north to Ballard and Lynnwood, east to Bellevue and Redmond, and south to Tacoma. This includes a new line extending from Westlake Station toward Seattle Center, Magnolia, and Ballard. These expansions would create a more robust light rail system that provides direct access to the proposed Seattle Center Arena via a new station near the northwest corner of Seattle Center (the precise location has yet to be determined).

A variety of pedestrian and bicycle projects are expected to be built by 2035, including the Lake to Bay streetscape improvements along Broad St, Thomas St, and Terry Ave N; green street improvements on Thomas St; and protected bicycle lanes on the 1st Ave N/Queen Anne Ave N couplet. See Appendix C, Tech Memo 3, Year 2020 and 2035 Background Transportation Network, for more details on the projects planned to be in place by 2035.

No Action Alternative

This section describes the conditions of the transportation system under the 2035 No Action Alternative in which KeyArena is not renovated. The 2035 No Action Alternative is the baseline against which the impacts of the project in 2035 are assessed. In other words, the 2035 No Action Alternative represents the cumulative transportation condition in 2035 without the proposed project, and Alternatives 1 and 2 represent that cumulative condition plus the proposed project. A comparison of the No Action Alternative versus Alternatives 1 and 2 indicates the direct impacts of the proposed arena.

Traffic Operations

As with the 2020 analysis, traffic volume forecasts were developed for 2035 conditions using the PSRC regional travel demand model. The forecasts take into account existing volumes, planned land use growth within the immediate study area (as well as throughout the city and region), and changing traffic patterns associated with planned projects. These forecasts represent changing travel demand and travel patterns that would occur with no renovation at KeyArena. Although the transit mode share within the City and the surrounding region is expected to grow with the light rail expansion, the continued growth throughout the region is nonetheless expected to result in a roughly 10% increase in pre-event peak hour traffic on Denny Way and Mercer St compared to 2020.

Connected autonomous vehicles (CAVs) could be widespread by 2035. But it is currently unknown whether they would be privately owned or would take the form of a subscription service in which individuals do not own a vehicle but rather use 1 from a pool of vehicles. It is also unknown whether government policies would result in increased vehicle occupancies (i.e., pooled rides), less “deadheading” (i.e., traveling to a destination with no one in the vehicle for a pick-up), managed curb space, parking restrictions, and other transportation effects. Some planners believe CAVs would reduce congestion and parking demand in urban areas, while others believe that if unregulated, they could lead to further suburban sprawl and growth in vehicle travel. Given the speculative nature of this evolving form of transportation, this study applies a “business as usual” approach and assumes that CAVs may be in the vehicle fleet by 2035 but operate in a similar way to current private vehicles. That said, it is expected that ridehailing would serve a greater percentage of trips under Alternatives 1 and 2 under 2035 conditions versus 2020 based on this mode’s recent growth in the Seattle area, combined with the potential that if ridehailing vehicles became autonomous, the cost per ride would likely decrease (due to

removal of the driver), further incentivizing its use. However, ridehailing vehicles are not assumed to be ubiquitous by 2035.

Average Seattle Center Attendance

Intersection delay and corridor travel times are expected to continue increasing between 2020 and 2035 independent of the arena renovation. On a day with Average Seattle Center Attendance, the number of intersections operating at LOS E or F would increase from 41 intersections in 2020 to 46 intersections in 2035 during the weekday pre-event peak hour. Additionally, eastbound travel operations of Mercer St and Denny Way are expected to experience greater queue spillback due to additional traffic growth. During the weekday post-event and Saturday pre-event peak hours in 2035, 1 and 6 intersections, respectively, would operate at LOS E or F.

Travel time along Mercer St and Denny Way was analyzed to identify corridor travel speed impacts. Table 4-24 summarizes projected travel speeds in 2035. Average travel speeds in the westbound directions of this streets would further degrade due to background traffic growth.

Table 4-24. Corridor Travel Speed – 2035 No Action Alternative –- Average Seattle Center Attendance

Corridor	2035 Weekday Pre-Event Peak Hour			
	Eastbound		Westbound	
	Average Travel Speed (MPH)	% of Free Flow Speed	Average Travel Speed	% of Free Flow Speed
Mercer St	2	20%	5.5	55%
Denny Way	1.5	15%	7.5	75%

MPH = miles per hour. Average free-flow travel speed of 10 MPH assumed given the presence of controls and measured speeds in this range under mostly free-flow conditions on these corridors.
Source: Prepared by Fehr & Peers, 2018.

Above-Average Seattle Center Attendance

Due to the additional increment of visitors to the Seattle Center campus, the Above-Average Seattle Center Attendance scenario would result in operations that are slightly worse than those expected with Average Seattle Center Attendance (Table 4-25).

Table 4-25. Corridor Travel Speed – 2035 No Action Alternative – Above-Average Seattle Center Attendance

Corridor	2035 Weekday Pre-Event Peak Hour			
	Eastbound		Westbound	
	Average Travel Speed (MPH)	% of Free Flow Speed	Average Travel Speed	% of Free Flow Speed
Mercer St	2 MPH	20%	5 MPH	50%
Denny Way	1.5 MPH	15%	5.5 MPH	55%

MPH = miles per hour.
Source: Prepared by Fehr & Peers, 2018.

Ridehailing

Under the No Action Alternative in 2035, ridehailing is expected to operate the same as it does today, although the overall share of trips is expected to increase as ridehailing increases in popularity. Pick-ups and drop-offs would occur in those locations most convenient to drivers and passengers rather than in a designated area.

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions, pick-up and drop-off activity is not expected to routinely block through lanes, bicycle facilities, or bus pullouts.

Above-Average Seattle Center Attendance

Under Above-Average Seattle Center Attendance conditions, more visitors are traveling to Seattle Center, and ridehailing would occur within a more congested traffic environment. Drivers may have a more difficult time finding appropriate curb space for loading and unloading, resulting in more frequently blocked through lanes, bicycle facilities, or bus pullouts. This condition is expected to be similar to, or slightly worse than, what currently occurs during major events at Seattle Center. The area along 1st Ave N between Harrison St and Republican St would be the most affected.

Transit

As described earlier, the regional light rail transit system will expand substantially by 2035, with a station near the northwest corner of Seattle Center. Specific bus routing and service levels are not as certain, but based on historic service level changes, it is assumed that bus frequencies would be higher in the future. METRO CONNECTS, King County Metro's long range transit vision (King County Metro, 2016), anticipates that transit service hours (i.e., total hours of bus service provided to riders) could roughly double between 2016 and 2040.

> Transit is poised to expand significantly between 2024 (when the ST2 expansion projects are complete) and 2035 (when the Ballard extension is complete). In the interim period, however, the new ST2 LINK light rail extensions (east to Redmond, south to Federal Way, north to Lynnwood) could significantly shift how people reach the arena. These regional lines converge at Westlake Station and could substantially add to "last mile" trips between Westlake and the arena via the Monorail, 3rd Ave bus routes, bike share, walking, or ridehailing.

Average Seattle Center Attendance

Reserve capacity on the LINK light rail was estimated based on Sound Transit's 2035 ridership demand model and the best available information regarding Sound Transit's service level plans (Sound Transit, 2018). Reserve capacity under the No Action Alternative – Average Seattle Center Attendance scenario is summarized in Table 4-26. These values pertain specifically to the new line that would extend from Westlake Station north through the study area, toward Ballard. For all analysis periods studied, reserve capacity is expected to be available on LINK in both directions.

Table 4-26. LINK Light Rail Reserve Capacity – No Action Alternative – Average Seattle Center Attendance

Analysis Period	Service Assumptions		Reserve Capacity (Number of Passengers)	
	Headway (minutes)	Cars per Train	To/From the South	To/From the North
Weekday Pre-event Peak Hour	6	4	2,901	6,784
Weekday Post-event Peak Hour	10	3	1,050	2,992
Saturday Pre-event Peak Hour	10	4	2,458	2,587

Source: Prepared by Fehr & Peers, 2018.

Metro is expected to restructure bus routing and service levels in the future to match regional growth and the light rail expansion. As is the case under 2020 conditions, it is projected that bus service would be provided such that ridership would not routinely reach crowding thresholds, although individual trips during the highest demand times may exceed those thresholds. The Monorail is also expected to have reserve capacity under the No Action Alternative – Average Seattle Center Attendance in 2035.

However, buses would be affected by the worsening congestion on study area corridors during the weekday pre-event peak hour under No Action Alternative – Average Seattle Center Attendance in 2035. Therefore, bus travel time and reliability would degrade as congestion increases.

Above-Average Seattle Center Attendance

During Above-Average Seattle Center Attendance conditions, the additional increment of visitors to the campus would result in increased ridership on LINK light rail and nearby bus routes. Reserve capacity under the No Action Alternative – Above-Average Seattle Center Attendance is summarized in Table 4-27. For all analysis periods studied, reserve capacity is expected to be available on LINK in both directions.

Table 4-27. LINK Light Rail Reserve Capacity – No Action Alternative – Above-Average Seattle Center Attendance

Analysis Period	Service Assumptions		Reserve Capacity (Number of Passengers)	
	Headway (minutes)	Cars per Train	To/From the South	To/From the North
Weekday Pre-event Peak Hour	6	4	2,399	6,664
Weekday Post-event Peak Hour	10	3	725	2,914
Saturday Pre-event Peak Hour	10	4	2,097	2,500

Source: Prepared by Fehr & Peers, 2018.

With the additional influx of visitors to Seattle Center, individual bus trips during the highest demand times are more likely to exceed crowding thresholds. The Monorail is also expected to have reserve capacity under No Action Alternative – Above-Average Seattle Center Attendance in 2035.

Buses would be operating in more severe congestion on study area corridors during the weekday pre-event peak hour under Above-Average Seattle Center Attendance conditions. Bus travel time and reliability would degrade as congestion increases.

Pedestrian Travel

Average Seattle Center Attendance

As the city's population and employment continue to grow, pedestrian activity in the study area would increase. The sidewalks and crosswalks in the study area are expected to accommodate that growth in the coming years, with no facilities routinely having demand exceed capacity.

Above-Average Seattle Center Attendance

Observations of pedestrian activity on a typical day with Above-Average Seattle Center Attendance (for example, a mid-sized event at KeyArena) suggest that no sidewalks or crosswalks routinely have demand exceeding capacity. Even with additional background growth in pedestrians by 2035, these conditions are not expected to substantively change. However, it is noted that large events (i.e., over 10,000 persons) can temporarily result in such conditions at key locations near the event venue (which could be KeyArena or another Seattle Center venue, depending on the large event location).

Bicycle Travel

All 2035 scenarios would increase congestion on most streets compared to 2020. The congestion on portions of 1st Ave N, Queen Anne Ave N, 5th Ave N, and Dexter Ave N are particularly notable as these facilities have on-street bicycle facilities. Bicyclists may feel less comfortable traveling on these streets when adjacent lanes experience "stop-and-go" traffic because such conditions can result in side-street vehicles encroaching into the major street to merge, thereby temporarily blocking the bicycle facilities. Conversely, further reductions in auto travel time reliability could make travel to the venue by bicycle more attractive.

Bicycle parking supply would remain the same as existing conditions under the No Action Alternative. The City has plans to construct protected bicycle lanes along the 1st Ave N and Queen Anne Ave N couplet by 2035. Under either attendance scenario, no bicycle facilities are expected to be consistently blocked by pedestrian overflows or vehicles dropping off or picking up patrons.

Parking

SDOT will continue to adjust its management of on-street parking supply to ensure that curb space is designated appropriately for the changing conditions. In particular, SDOT would proactively manage parking within roughly a quarter-mile of light rail stations to discourage commuter parking, which would include much of the parking study area. New developments in the study area would add some off-street supply within a walkable distance to the arena site, but it would be speculative to estimate which locations and how much parking would be publicly available. For the purposes of this analysis, the parking supply is expected to remain the same as 2020. Overall, background parking occupancy is expected to increase by 10% over 2020 conditions, which is commensurate with overall vehicle trip growth.

Average Seattle Center Attendance

Table 4-28 summarizes parking occupancy under Average Seattle Center Attendance conditions. Total on-street parking occupancy is expected to be 74% on a weekday and 88% on a Saturday. Total off-street parking occupancy is expected to be 14% on a weekday and 25% on a Saturday.

Table 4-28. Parking Occupancy – 2035 No Action Alternative – Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	80 (76%)	76 (72%)
	North	1,161 (78%)	1,477 (99%)
	South	701 (66%)	779 (74%)
	West	383 (80%)	429 (89%)
	Subtotal	**2,325 (74%)**	**2,761 (88%)**
Off-Street	East	300 (14%)	303 (14%)
	North	162 (12%)	585 (42%)
	South	209 (14%)	400 (28%)
	West	29 (30%)	5 (5%)
	Subtotal	**700 (14%)**	**1,293 (25%)**
On-Street & Off-Street	**Total**	**3,025 (37%)**	**4,054 (49%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Refer to Figure 4-11 for each geographic parking subarea.
Source: Prepared by Fehr & Peers, 2018.

Above-Average Seattle Center Attendance

The mode share of visitors to Seattle Center will change substantially by 2035 as private vehicle use decreases in favor of light rail and ridehailing trips. This change in travel behavior would result in lower parking demand from Seattle Center visitors. Table 4-29 summarizes parking occupancy under Above-Average Seattle Center Attendance conditions. Total on-street parking occupancy is expected to be 75% on a weekday and 89% on a Saturday. Total off-street parking occupancy is expected to be 35% on a weekday and 44% on a Saturday.

Under Average Seattle Center Attendance conditions for the No Action Alternative, weekday evening off-street parking occupancy increases from 12% under 2020 conditions to 14% under 2035 conditions. In contrast, under Above-Average Seattle Center Attendance conditions, the weekday evening off-street parking occupancy decreases from 46% under 2020 conditions to 35% under 2035 conditions. This decrease is caused by a greater percentage of Above-Average Seattle Center event attendees shifting to non-private auto modes of travel (i.e., less parking demand) between 2020 and 2035.

Table 4-29. Parking Occupancy – 2035 No Action Alternative – Above-Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	80 (76%)	76 (72%)
	North	1,178 (79%)	1,477 (99%)
	South	713 (68%)	809 (77%)
	West	383 (80%)	429 (89%)
	Subtotal	**2,354 (75%)**	**2,791 (89%)**
Off-Street	East	549 (25%)	675 (31%)
	North	752 (55%)	915 (66%)
	South	443 (31%)	626 (43%)
	West	29 (30%)	5 (5%)
	Subtotal	**1,773 (35%)**	**2,221 (44%)**
On-Street & Off-Street	**Total**	**4,127 (50%)**	**5,012 (61%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Refer to Figure 4-11 for each geographic parking subarea.
Source: Prepared by Fehr & Peers, 2018.

Bus/Truck Staging

Charter buses and trucks currently stage using curb space in the vicinity of the arena site in accordance with the SDOT and Seattle Center MOA for Event Curbside Management (2011). Through that agreement, Seattle Center reserves curb space on Thomas St, Warren Ave N, 2nd Ave N, Republican St, 4th Ave N, and Roy St for loading, unloading, and staging of events. It is assumed this arrangement stays in place and all KeyArena charter bus and truck staging consistent with that arrangement is permitted by SDOT. In other words, there are no changes related to charter buses or truck staging under the No Action Alternative.

Paratransit

Under the No Action Alternative, paratransit vehicles would continue to load and unload along the east side of 1st Ave N adjacent to KeyArena, as well as on 2nd Ave N just south of KeyArena. This designated passenger loading/unloading curb space would be available under both Seattle Center attendance conditions. However, with an unregulated ridehailing system, the passenger loading/unloading space used by paratransit would sometimes be blocked by non-transit vehicles during periods of high demand.

Safety

No study intersections are identified as high collision locations. With the implementation of protected bicycle lanes along 1st Ave N, pick-up/drop-off activity is not expected to block through lanes, bicycle facilities, or bus pullouts.

Summary of Transportation Conditions in 2035 for the No Action Alternative

Despite the extension of LINK light rail to the study area by 2035, continued land development in the area would result in an approximately 10% increase in vehicle traffic over 2020 conditions. This results in

marginally worse overall intersection operating conditions and a decrease in travel times on primary east-west corridors. Although bus capacity is expected to be sufficient under the 2035 No Action Alternative – Average Seattle Center Attendance scenario, the traffic operations conditions affect transit service during the weekday pre-event peak hour. These conditions are related to commute traffic throughout the Uptown, South Lake Union, Belltown, and Downtown Urban Centers and would degrade bus speeds and schedule reliability. LINK light rail would have reserve capacity during all analysis periods under the No Action Alternative – Average Seattle Center Attendance scenario.

During an Above-Average Seattle Center Attendance condition, more localized effects are experienced in the study area in addition to the degraded traffic operations and transit conditions described above. Because ridehailing vehicles would not have regulated loading and unloading locations under the No Action Alternative and the number of ridehailing vehicles would increase by 2035, it is expected that they would regularly block through lanes, bicycle facilities, and bus pullouts before and after events, adversely affecting transit, bicycle travel, paratransit, and safety. LINK light rail would have reserve capacity during all analysis periods under the No Action Alternative – Above-Average Seattle Center Attendance scenario.

Alternative 1: OVG Proposal

This section describes the potential impacts to transportation that are likely under Alternative 1. The travel characteristics of attendees at the arena would change by 2035. In particular, light rail is expected to carry nearly one-quarter of arena attendees, with a slight decrease in bus ridership as some transit users shift from bus to light rail. The growth of ridehailing is expected to continue, carrying one-quarter of arena attendees by 2035. As the mode share of light rail and ridehailing grows, private vehicle use by arena attendees would drop to 35%. Table 4-30 summarizes the mode share estimates for attendees of the arena in 2035. Details are presented in Tech Memo 7, Project Travel Characteristics – Year 2035.

Table 4-30. Expected Mode Share for Arena Attendees in 2035

Travel Mode	Weekday NBA Game Pre-Event Peak Hour	Weekday NBA Game Post-Event Peak Hour	Saturday Concert Pre-Event Peak Hour	Notes
Private Vehicle	35%	38%	41%	Some of these trips may also include longer walks or bike share travel to arena.
Light Rail to/from Seattle Center Arena	23%	23%	20%	Some of these light rail trips may require transfers at Westlake Station.
Bus to/from Seattle Center Arena	6%	5%	5%	Percentages reflect bus trips to/from routes that have access directly adjacent to Seattle Center.
Taxi / TNC / Other Drop-off	25%	22%	25%	Percentages represent final mode of travel in/out of study area.
Walk to/from Nearby Origin	8%	8%	6%	
Monorail	2%	3%	2%	
Bicycle	1%	1%	1%	

Source: Prepared by Fehr & Peers, 2018. Refer to Appendix C, Tech Memo 7, Project Travel Characteristics-Year 2035.

Table 4-31 summarizes the arena trip generation estimates using the mode share described above. AVO and temporal distribution estimates are expected to remain the same as described for 2020. These estimates reflect the sold-out capacity for the renovated arena and apply to both Alternatives 1 and 2. The distribution of trips to the arena would be the same in 2035 as 2020 (see Table 4-14).

Table 4-31. Peak Hour Vehicle Trip Generation of Proposed Arena (Alternatives 1 and 2) in 2035

Traveler Type	Weekday NBA Game Pre-Event Peak Hour Vehicle Trips			Weekday NBA Game Post-Event Peak Hour Vehicle Trips			Saturday Concert Pre-Event Peak Hour Vehicle Trips		
	In	Out	Total	In	Out	Total	In	Out	Total
Attendees traveling by private vehicle	1,676	0	1,676	0	2,653	2,653	1,634	0	1,634
Attendees traveling by TNC/taxi/drop-off vehicle	1,197	1,197	2,394	1,667	1,667	3,334	996	996	1,992
Employees traveling by private vehicle	16	0	16	0	32	32	16	0	16
Employees traveling by TNC/Taxi/Drop-off	5	5	10	10	10	20	5	5	10
Miscellaneous[1]	15	5	20	5	10	15	15	5	20
Total	**2,909[2]**	**1,207**	**4,116**	**1,682**	**4,372[2]**	**6,054**	**2,666**	**1,006**	**3,672**

1. Miscellaneous trips include delivery vehicles, emergency vehicles, utility vehicles, etc.

2. Weekday pre-event in and weekday post-event are not equal due to differing mode share assumptions, AVO, and temporal distribution of travel for each analysis period.

Source: Prepared by Fehr & Peers, 2018.

Traffic Operations

Traffic volumes associated with the renovated arena are layered on top of the No Action Alternative forecasts for the traffic operations analysis. Similar to 2020 conditions, this analysis scenario does not assume any formalized traffic management strategies to accommodate arriving attendees during the pre-event peak hour or departing vehicles during the post-event peak hour beyond what is currently in place.

Average Seattle Center Attendance

Figure 4-26 displays the intersection LOS for Average Seattle Center Attendance conditions under the No Action Alternative and with Alternative 1 (Alternative 2 is described later). Figure 4-27 displays the intersections impacted under 2035 Alternative 1 – Average Seattle Center Attendance. For intersections that operate acceptably under the No Action Alternative, this is defined as dropping to an unacceptable LOS (i.e., LOS E or F for signalized intersections) and adding at least 5 seconds of delay, or adversely affecting unsignalized intersections based on the degree of congestion increase, modal conflicts, and other considerations. For intersections that operate unacceptably under the No Action Alternative, this is defined as Alternative 1 adding at least 5 seconds of delay.

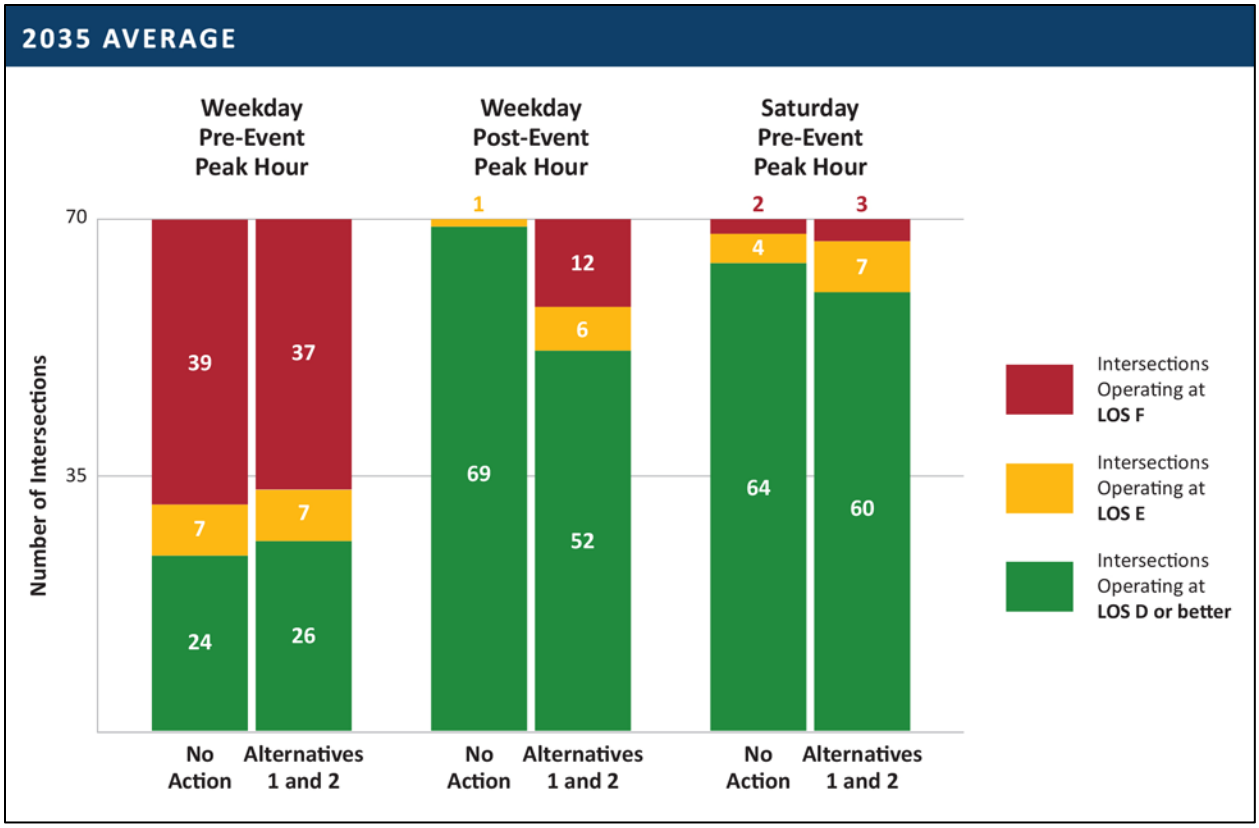


Figure 4-26. Intersection LOS Summary – 2035 Conditions with Average Seattle Center Attendance

Alternative 1 would cause westbound travel on these roadways to experience moderate to substantial delay increases when compared to the No Action Alternative. Refer to Appendix C, Tech Memo 8, 2035 Analysis Results for Roadway and Pedestrian Systems, for more detail. As described in the 2020 analysis section, the number of intersections within the study area operating at LOS D or better actually increases under the weekday pre-event peak hour for Alternatives 1 and 2. As was the case before, this is more of a technical anomaly than a description of actual conditions. Some intersections toward the center of the study area would experience better LOS because congestion entering the network (e.g., existing I-5, traveling from the west, etc.) will constrain the traffic that reached downstream intersections. Additionally, because intersection LOS is the average of delay experienced on all approaches, higher westbound traffic volumes will reduce the average overall delay along the Mercer St and Denny Way corridors.

During the weekday pre-event peak hour on a day with Average Seattle Center Attendance, 23 intersections would be impacted under Alternative 1. During the weekday post-event peak hour, 19 intersections would be impacted under Alternative 1. During the Saturday pre-event peak hour, 7 intersections would be impacted under Alternative 1. Table 4-32 summarizes projected travel speeds along Mercer St and Denny Way under Alternative 1 – Average Seattle Center Attendance.

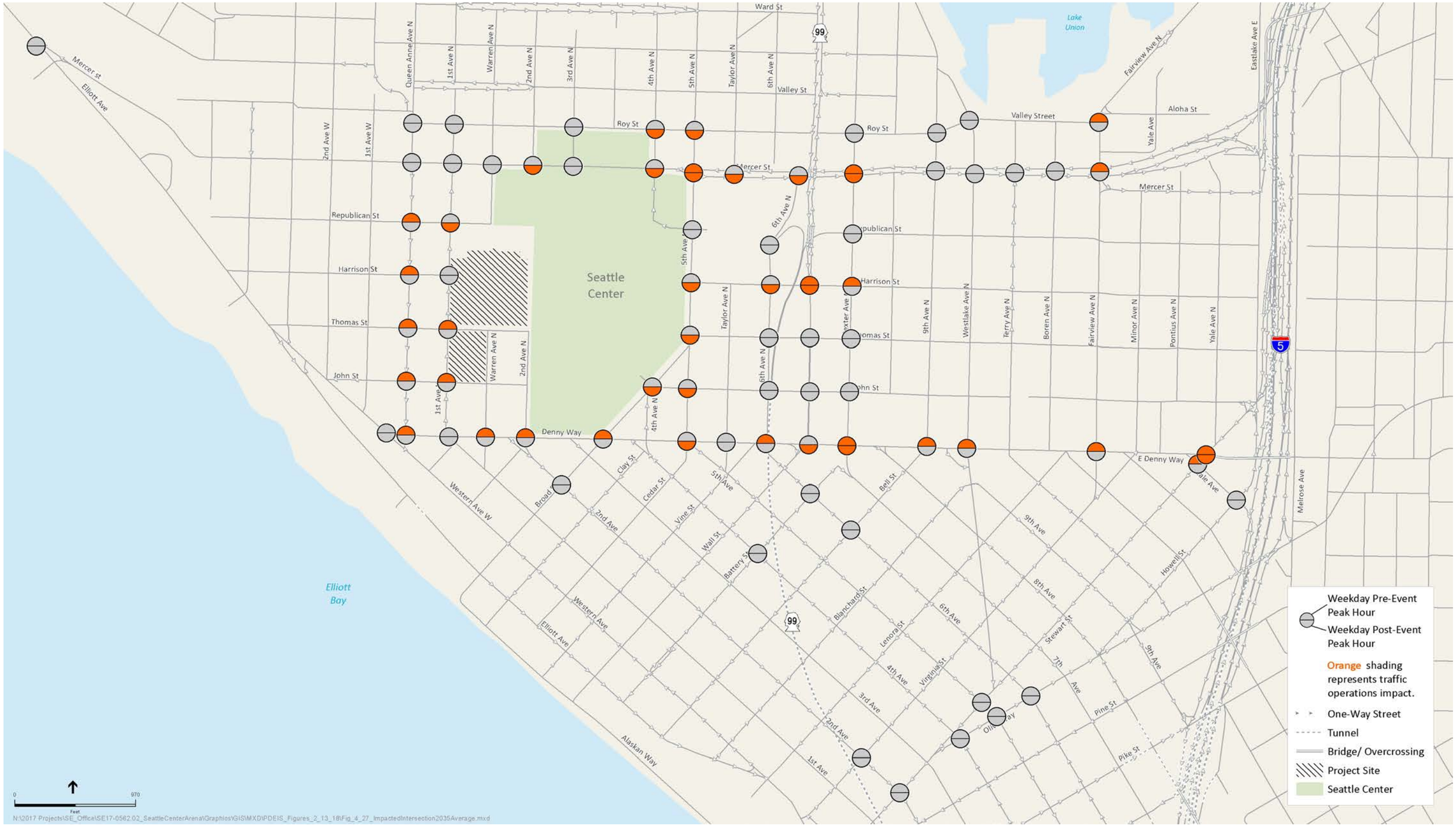


Figure 4-27. Impacted Intersections – 2035 Alternative 1 –Average Seattle Center Attendance Weekday Pre-Event and Post-Event Peak Hour Condition

Table 4-32. Corridor Travel Speed – 2035 Alternative 1 – Average Seattle Center Attendance

Corridor	Weekday Pre-Event Peak Hour			
	Eastbound		Westbound	
	Average Travel Speed (MPH)	% of Free Flow Speed	Average Travel Speed	% of Free Flow Speed
Mercer St	2 MPH	20%	4.5 MPH	45%
Denny Way	1.5 MPH	15%	3.5 MPH	35%

MPH = miles per hour. Average free-flow travel speed of 10 MPH assumed given presence of controls and measured speeds in this range under mostly free-flow conditions on these corridors.

Source: Prepared by Fehr & Peers, 2018.

This table reveals the following findings:

- Average travel speeds on eastbound Mercer St and Denny Way between Seattle Center and I-5 would be unchanged relative to the No Action Alternative. Westbound travel speeds on Mercer St would be reduced from 5.5 MPH under the No Action Alternative to 4.5 MPH under Alternative 1 – Average Seattle Center Attendance. The westbound travel speed on Denny Way would decrease from 7.5 MPH under the No Action Alternative to 3.5 MPH under Alternative 1 – Average Seattle Center Attendance. Because the westbound travel speed would degrade from above to below 40% of the free flow travel speed, this is a significant impact.

Above-Average Seattle Center Attendance

Figure 4-28 displays the number of intersections operating at LOS D or better, LOS E, and LOS F for Above-Average Seattle Center Attendance conditions under the No Action Alternative and with Alternative 1. Impacted intersections are shown in Figure 4-29. For intersections that operate acceptably under the No Action Alternative, this is defined as dropping to an unacceptable LOS (i.e., LOS E or F for signalized intersections) and increasing the average delay by 5 seconds, or adversely affecting unsignalized intersections based on the degree of congestion increase, modal conflicts, and other considerations. For intersections that operate unacceptably under the No Action Alternative, this is defined as Alternative 1 adding at least 5 seconds of delay.

Alternative 1 – Above-Average Seattle Center Attendance would cause significant impacts at 12 intersections during the weekday pre-event peak hour, 20 intersections during the weekday post-event peak hour, and 9 intersections during the Saturday pre-event peak hour.

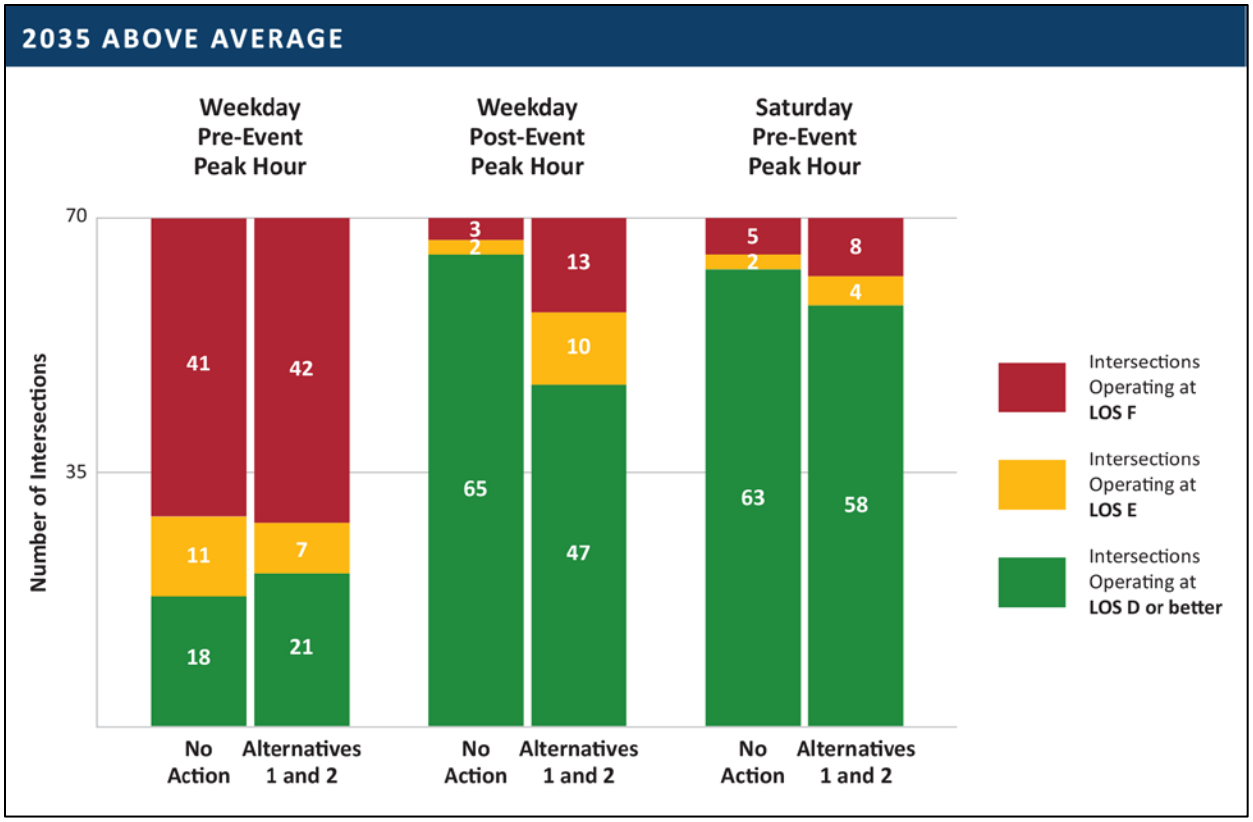


Figure 4-28. Intersection LOS Summary – 2035 Conditions with Above-Average Seattle Center Attendance

Table 4-33 summarizes projected travel speeds along Mercer St and Denny Way under Alternative 1 – Above-Average Seattle Center Attendance. During the weekday pre-event peak hour, the average travel speed on westbound Denny Way from Fairview Ave N to Taylor Ave would be reduced to less than 40% of its free-flow speed. Alternative 1 – Above-Average Seattle Center Attendance would also cause traffic exiting both directions of I-5 at Mercer St to queue back toward the mainline.

Table 4-33. Corridor Travel Speed – 2035 Alternative 1 – Above-Average Seattle Center Attendance

Corridor	Eastbound		Westbound	
	Average Travel Speed (MPH)	% of Free Flow Speed	Average Travel Speed (MPH)	% of Free Flow Speed
Mercer St	2	20%	4.5	45%
Denny Way	1.5	15%	3	30%

MPH = miles per hour.

Source: Prepared by Fehr & Peers, 2018.

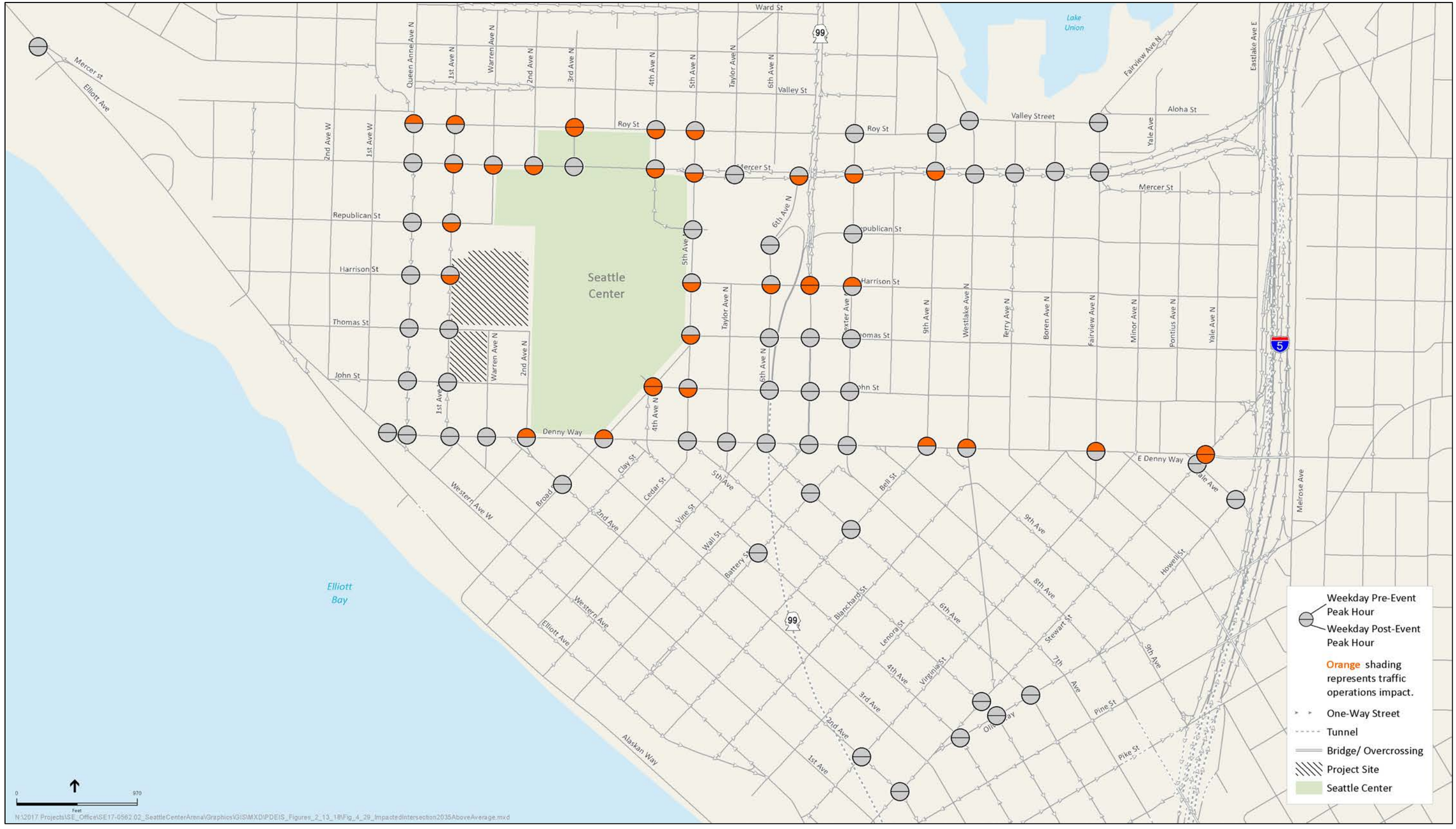


Figure 4-29. Impacted Intersections – 2035 Alternative 1 – Above-Average Seattle Center Attendance Weekday Pre-Event and Post-Event Peak Hour Condition

Ridehailing

Ridehailing is expected to become more prevalent by 2035, and its regulation would be the same in 2035 as in 2020. Ridehailing vehicles would drop off passengers in accordance with their selected destination and often at whatever specific block location the passenger requests. The City would regulate post-event pick-ups to only occur at a handful of locations surrounding and near the perimeter of the Seattle Center campus.

Under this plan, during pre-determined event times (to be coordinated by Seattle Center and SDOT), a customer requesting a ride from the area bounded by Roy St, Dexter Ave N, Denny Way, and Queen Anne Ave N would have to meet their vehicle at one of the designated pick-up locations during post-event conditions.

Average Seattle Center Attendance

Under Alternative 1 – Average Seattle Center Attendance, the renovated arena would attract substantial ridehailing activity during events such as an NBA game or concert. Drop-off activity would be similar to that observed during large KeyArena events, which sometimes result in ridehailing vehicles blocking through lanes, bicycle facilities, or bus pullouts, particularly along the arena frontage along 1st Ave N. Some of the designated ridehailing pick-up locations may temporarily repurpose a parking or travel lane, but this would be in accordance with a TMP in coordination with SDOT to minimize the effects to other modes.

Above-Average Seattle Center Attendance

Under Alternative 1 – Above-Average Seattle Center Attendance, ridehailing would occur within a slightly more congested traffic environment. Drivers may have a more difficult time finding appropriate curb space to drop off passengers, resulting in more frequently blocked through lanes, bicycle facilities, or bus pullouts during the pre-event peak hours, particularly along 1st Ave N. Some of the designated ridehailing pick-up locations may temporarily repurpose a parking or travel lane, but this would occur in accordance with a TMP in coordination with SDOT to minimize the effects to other modes.

Transit

Average Seattle Center Attendance

Table 4-34 lists the number of event attendees and employees that are expected to ride LINK light rail to the renovated arena during each peak hour under Alternative 1 – Average Seattle Center Attendance. During the weekday post-event peak hour, nearly 3,900 attendees and employees are expected to leave the arena heading south via light rail. This demand is well in excess of reserve capacity, assuming 10-minute headways and 3 cars per train (typical Sound Transit service levels for the evening). To serve this post-event surge in demand, LINK would need to operate 4 cars per train at 7-minute headways. All other analysis periods and directions could accommodate the attendee demand over the course of the peak hour.

Table 4-34. LINK Light Rail 2035 Reserve Capacity – Alternative 1 – Average Seattle Center Attendance

Analysis Period	To/From the South		To/From the North	
	Number of Arena LINK Riders	Percent Usage of Overall Reserve Capacity	Number of Arena LINK Riders	Percent Usage of Overall Reserve Capacity
Weekday Pre-event Peak Hour	2,432	84%	128	2%
Weekday Post-event Peak Hour	3,861	368%	203	7%
Saturday Pre-event Peak Hour	1,844	75%	97	4%

Service level assumptions are the same as shown for the No Action Alternative.

Source: Prepared by Fehr & Peers, 2018.

Travel by Monorail

The findings for 2020 would also apply to 2035 because Monorail ridership is expected to be slightly lower than in 2020 (due to the more direct connection from other transit service via light rail). In summary, the largest demand would occur after an event, with the first train completely full, the second train mostly occupied, and the third train uncrowded. During the post-event peak hour, project-related riders could be accommodated via normal service (i.e., 10-minute headways). However, some passengers may have to wait up to 20 minutes due to Monorail train capacity constraints.

Travel by Bus

As stated under the No Action Alternative, Metro is expected to restructure bus routing and service levels such that ridership would not routinely reach crowding thresholds, although individual trips during the highest demand times may exceed those thresholds. Project demand for buses would decrease somewhat by 2035 because some of the transit demand would shift to LINK light rail. Therefore, bus capacity effects of the project would be less than those stated for 2020. However, increasing congestion would adversely affect bus speeds and reliability in 2035. Additionally, ridehailing pick-up and drop-off activities have the potential to block bus stops and layover areas, slowing bus travel and interfering with transit operations.

Capacity at nearby bus stops was also considered. The northbound stop at 1st Ave N and Republican St is expected to have adequate capacity because riders could spill back into the arena plaza during periods of highest demand. However, the southbound stops along Queen Anne Ave N are more constrained due to sidewalk width and street furniture, particularly at John St and Harrison St. This could lead to riders blocking other pedestrians trying to travel along the sidewalk while waiting for buses during the post-event peak hour.

Above-Average Seattle Center Attendance

Table 4-35 lists the number of event attendees and employees that are expected to ride LINK to the renovated arena during each peak hour under Alternative 1 – Above-Average Seattle Center Attendance. The number of riders generated by the renovated arena would remain the same, but there

would be lower reserve capacity available because of the additional ridership generated by other events at Seattle Center.

Again, the weekday post-event peak hour would not have enough reserve capacity to the south to accommodate the ridership surge with typical evening service. To serve this post-event surge in demand, LINK would need to operate 4 cars per train at 7-minute headways. With Above-Average Seattle Center Attendance, the additional riders during the weekday pre-event peak hour would slightly exceed the reserve capacity from the south. Because the trains would already be operating at peak hour service levels, this indicates that without staging additional trains, LINK light rail would be beyond the crowding threshold for at least an hour and some riders would need to wait for the next train to board. All other analysis periods and directions could accommodate the attendee demand over the course of the peak hour.

Table 4-35. LINK Light Rail Reserve Capacity – 2035 Alternative 1 – Above-Average Seattle Center Attendance

Analysis Period	To/From the South		To/From the North	
	Number of Arena LINK Riders	Percent Usage of Overall Reserve Capacity	Number of Arena LINK Riders	Percent Usage of Overall Reserve Capacity
Weekday Pre-event Peak Hour	2,432	101%	128	2%
Weekday Post-event Peak Hour	3,861	532%	203	7%
Saturday Pre-event Peak Hour	1,844	88%	97	4%

Service level assumptions are the same as shown for the No Action Alternative.
Source: Prepared by Fehr & Peers, 2018.

Travel by Monorail

Monorail ridership by project attendees would remain the same under Above-Average Seattle Center Attendance conditions. Although the background reserve capacity would be lower, the Monorail should still accommodate all riders over the course of the post-event peak hour. Some passengers may have to wait up to 20 minutes due to Monorail train capacity constraints.

Travel by Bus

As stated under the No Action Alternative, Metro is expected to restructure bus routing and service levels such that ridership would not routinely reach crowding thresholds, although individual trips during the highest demand times may exceed the thresholds. Project demand for buses would decrease somewhat by 2035 because some of the transit demand would shift to LINK light rail. Therefore, bus capacity effects of the project would be less than those stated for 2020. However, increasing congestion would adversely affect bus travel time and reliability in 2035.

As described above, the southbound bus stops along Queen Anne Ave N are somewhat constrained, particularly at John St and Harrison St. This could lead to riders blocking other pedestrians trying to travel along the sidewalk while waiting for buses during the post-event peak hour.

Pedestrian Travel

In 2035, fewer people would walk between parking lots and the arena due to the decreased private vehicle mode share, but more people would walk to the nearby LINK light rail station and the designated ridehailing pick-up locations. The largest shift in pedestrian flows would be due to the new LINK light rail station, so the 2035 analysis focused on the capacity of nearby sidewalks and crosswalks to accommodate that demand. The specific station location is unknown, but for the EIS analysis, the project demand was distributed across the crosswalks at 2 nearby intersections to test the capacity if arena attendees crossed an adjacent street to reach the station (in other words, no station portal was assumed to be east of 1st Ave N).

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions with Alternative 1, all sidewalks would have sufficient capacity to carry the pedestrian demand without overflow into adjacent streets. The facility nearest the capacity threshold would be 2nd Ave N between John St and Denny Way. Some signalized intersections in the vicinity of the project provide sizeable areas for pedestrians to wait to cross the intersection. Examples exist along portions of 5th Ave N (e.g., at Harrison St). However, other intersections have limited size waiting areas to accommodate pedestrians. Examples include the 1st Ave N/Mercer St and 1st Ave N/Harrison St intersections.

As noted in the 2020 analysis, pedestrian flows at 1 crosswalk (the north leg of the 5th Ave N/Harrison St intersection) are expected to exceed capacity. Increased demand across 1st Ave N is expected at the unmarked, unsignalized crossings at Thomas St and John St. Lastly, the new light rail station planned near Seattle Center by 2035 would be used by some arena attendees. Assuming a station location west of 1st Ave N, the east-west crosswalks that most directly access the station (likely Republican St or Harrison St) would not meet the travel demand. Additionally, the corner waiting areas at the west sides of these intersections may be too small to accommodate pre-event surges.

Above-Average Seattle Center Attendance

Under Above-Average Seattle Center Attendance conditions, the majority of the added pedestrian travel (beyond Average Seattle Center Attendance conditions) would occur between the LINK light rail stations, Mercer St, 1st Ave N, and 5th Ave N garages and Seattle Center venues east of the arena. Few additional sidewalks and crosswalks would be affected by a direct trip between these parking facilities and the arena. In other words, the sidewalks and crosswalks between these parking facilities and the Seattle Center venues tend to have capacity, with the exception of the 5th Ave N/Harrison St north leg crosswalk, which would be further impacted by people parking east of Seattle Center and traveling to campus venues. Attendees who visit nearby restaurants may result in additional sidewalk/ crosswalk use, but this travel would not exceed capacity. As described earlier, the same crosswalks and corner waiting areas that provide access between the LINK light rail station and the arena are likely to be too small to meet demand under 2035 Above-Average Seattle Center Attendance conditions with the renovated arena.

Bicycle Travel

The project site plan does not show any on-site short-term or long-term bicycle parking spaces. Additionally, there are no current plans for a bicycle valet program.

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions, vehicles (ridehailing or otherwise) could temporarily block bicycle facilities when dropping off passengers during the pre-event peak hours. While temporary, this blockage would create a challenging environment for bicyclists that must pull into a vehicle lane to move around a stopped vehicle blocking the bicycle facility. Post-event blockages are unlikely to occur because of the designated ridehailing pick-up locations.

Above-Average Seattle Center Attendance

With above-average attendance on the Seattle Center campus, including an event at the arena, vehicles (ridehailing or otherwise) could temporarily block bicycle facilities when dropping off passengers during the pre-event peak hours. This would likely be more frequent given the increased congestion during an Above-Average Seattle Center Attendance condition. While temporary, this blockage would create a challenging environment for bicyclists that must pull into a vehicle lane to move around a stopped vehicle blocking the bicycle facility. Post-event blockages are unlikely to occur because of the designated ridehailing pick-up locations.

Parking

Parking demand generated by Alternative 1 would decrease by 2035 (compared to 2020) commensurate with the decrease in private vehicle trip generation. Parking assignments were completed in the same way as described for 2020: vehicle trips generated by the renovated arena were assigned to on-street and off-street parking locations that are currently anticipated to be available for public parking. Again, parking that would occur outside of the parking study area (for example at lots along the Dexter Ave N corridor) is not reflected in the following tables.

Average Seattle Center Attendance

Table 4-36 summarizes 2035 parking occupancy under Alternative 1 – Average Seattle Center Attendance. Total on-street parking occupancy is expected to be 86% on a weekday and 96% on a Saturday. Total off-street parking occupancy is expected to be 50% on a weekday and 65% on a Saturday. Compared to the No Action Alternative, Alternative 1 would result in on-street occupancies that cause a substantial number of vehicles to circulate for multiple blocks while looking for parking and increasing conflicts with other modes. Because paid parking and time limits are not in effect on Sundays, on-street parking occupancies would likely be higher than reflected for weekdays and Saturdays.

Table 4-36. Parking Occupancy – 2035 Alternative 1 – Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	94 (90%)	94 (90%)
	North	1,307 (88%)	1,419 (95%)
	South	847 (80%)	1,029 (97%)
	West	439 (91%)	465 (97%)
	Subtotal	**2,687 (86%)**	**3,007 (96%)**
Off-Street	East	992 (45%)	1,269 (58%)
	North	739 (54%)	1,095 (80%)
	South	1,010 (53%)	1,216 (64%)
	West	57 (59%)	47 (49%)
	Subtotal	**2,798 (50%)**	**3,627 (65%)**
On-Street & Off-Street	**Total**	**5,485 (63%)**	**6,634 (76%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Refer to Figure 4-11 for each geographic parking subarea. Includes the 450-space garage beneath the renovated arena.
Source: Prepared by Fehr & Peers, 2018.

Above-Average Seattle Center Attendance

Table 4-37 summarizes parking occupancy with Above-Average Seattle Center Attendance conditions. Compared to the Average Seattle Center Attendance condition, Alternative 1 – Above-Average Seattle Center Attendance would result in a slight increase to on-street parking because the occupancies are already quite high. Larger increases would occur for off-street parking.

Total on-street parking occupancy is expected to be 88% on a weekday and 96% on a Saturday. Total off-street parking occupancy is expected to be 59% on a weekday and 68% on a Saturday. Alternative 1 – Above-Average Seattle Center Attendance would result in on-street occupancies that cause vehicles to circulate for multiple blocks while looking for parking and increasing conflicts with other modes. Because paid parking and time limits are not in effect on Sundays, on-street parking occupancies would likely be higher than reflected for weekdays and Saturdays.

The Above-Average Seattle Center Attendance scenario reflects a situation with multiple events occurring on campus of varying size and timing. Visitors arriving for an earlier event would be more likely to find parking at the most convenient lots, while those arriving for a later event may find those lots full. Because of the dynamic nature of event scheduling at Seattle Center, this will affect venues differently depending on the other events on campus on any particular day.

Table 4-37. Parking Occupancy – 2035 Alternative 1 – Above-Average Seattle Center Attendance

Parking Type	Subarea	Weekday Evening Occupancy	Saturday Evening Occupancy
On-Street	East	94 (90%)	94 (90%)
	North	1,335 (90%)	1,425 (96%)
	South	875 (83%)	1029 (97%)
	West	439 (91%)	465 (97%)
	Subtotal	**2,743 (88%)**	**3,013 (96%)**
Off-Street	East	1,221 (56%)	1,356 (62%)
	North	928 (67%)	1,131 (82%)
	South	1,045 (55%)	1,256 (66%)
	West	63 (66%)	53 (55%)
	Subtotal	**3,257 (59%)**	**3,796 (68%)**
On-Street & Off-Street	**Total**	**6,000 (69%)**	**6,809 (78%)**

Includes only publicly available spaces that are expected to be open to attendees for evening. Refer to Figure 4-11 for each geographic parking subarea. Includes the 450-space garage beneath the renovated arena.
Source: Prepared by Fehr & Peers, 2018.

Bus/Truck Staging

Charter buses and trucks currently stage using curb space in the vicinity of the project site in accordance with the SDOT and Seattle Center MOA for Event Curbside Management (2011). Through that agreement, Seattle Center reserves curb space on Thomas St, Warren Ave N, 2nd Ave N, Republican St, 4th Ave N, and Roy St for loading, unloading, and staging of events. While most of those locations would remain available with a renovated arena, charter buses would not be staged on Thomas St due to the new south plaza and underground parking garage entrance on Thomas St.

Alternative 1 would have additional underground truck/bus storage compared to the space available south of KeyArena today. However, given the larger shows accommodated by the renovated arena, on-street staging would still likely be required. Seattle Center and SDOT would likely modify the MOA to include other nearby locations for staging with a similar permitting process as currently used, such that enough staging space is available whether Seattle Center is operating at an average or above-average attendance level. This would likely be part of a broader review of curb space management in the area by SDOT. Renegotiation of the MOA could affect on-street parking supply if curb space currently used for general on-street parking is regularly reserved for event staging.

Paratransit

Under Alternative 1, paratransit vehicles would continue to load and unload along the east side of 1st Ave N adjacent to the arena, as well as on 2nd Ave N just south of KeyArena. This designated passenger loading/unloading curb space would be available under both the average and above-average conditions. Although ridehailing pick-ups would be regulated, drop-offs during the pre-event peak hours would remain unregulated. Based on observations of current drop-off activity at KeyArena, passenger

loading/unloading space used by paratransit would sometimes be blocked by non-transit vehicles during periods of high demand, such as drop-offs before an event at the renovated arena.

Safety

No study intersections are currently identified as high collision locations. Under both Average and Above-Average Seattle Center Attendance conditions, bicycle safety may be affected by vehicles (ridehailing or otherwise) temporarily blocking bicycle facilities when dropping off passengers during the pre-event peak hours. Depending on the final location and design of the LINK light rail station, pedestrian safety could be affected by large surges of pedestrian demand between the arena and the station.

Summary of Transportation Impacts in 2035 – Alternative 1

Average Seattle Center Attendance

Under Average Seattle Center Attendance conditions in Year 2035, Alternative 1 would result in adverse impacts when compared to the No Action Alternative. This comparison reflects how the transportation system would be affected on a day without a KeyArena event versus a day with a sold-out event at the renovated arena. Alternative 1 would cause significant impacts at 23 intersections during the weekday pre-event peak hour, 19 intersections during the weekday post-event peak hour, and 7 intersections during the Saturday pre-event peak hour. During the weekday pre-event peak hour, the average travel speed on westbound Denny Way from Fairview Ave N to Taylor Ave would be reduced to less than 40% of its free-flow speed, which would be a significant impact. Alternative 1 would also cause traffic exiting both directions of I-5 at Mercer St to queue back toward the mainline.

Transit would experience significant impacts due to overcapacity conditions on southbound LINK light rail trains in the post-event condition, as well as travel time and reliability degradation associated with the traffic operations findings. Because ridehailing vehicles would not have regulated unloading locations during the pre-event peak hours, they would sometimes block through lanes, bicycle facilities, and bus pullouts, resulting in significant impacts to transit, bicycle travel, and safety, particularly along 1st Ave N. No significant impacts related to ridehailing are expected during the post-event peak hours.

Compared to No Action Alternative, Alternative 1– Average Seattle Center Attendance would improve the weekday post-event condition related to ridehailing, bicycle travel, and paratransit because ridehailing vehicles would only pick-up in designated spaces. Significant pedestrian impacts are expected at the 5th Ave N/Harrison St crosswalk due to high demand and at the pedestrian crossings and western corners of the intersection that provides the most direct access to LINK light rail.

On-street parking occupancy levels on weekdays and Saturdays suggest that a substantial number of vehicles would circulate for multiple blocks looking for parking and increasing conflicts with other modes; this would be a significant impact. Because paid parking and time limits are not in effect on Sundays, parking impacts are also expected on Sundays.

Above-Average Seattle Center Attendance

With Above-Average Seattle Center Attendance conditions, traffic operations would be congested under both the No Action Alternative and Alternative 1, although Alternative 1 would result in additional delays on key corridors and intersections. This comparison reflects how the transportation system would change from a high activity day at Seattle Center including a KeyArena event to a high activity day at Seattle Center with a sold-out event at the renovated arena.

The impacts described for the Average Seattle Center Attendance scenario would be exacerbated under the Above-Average Seattle Center Attendance scenario. Alternative 1 would cause significant impacts at 12 intersections during the weekday pre-event peak hour, 20 intersections during the weekday post-event peak hour, and 9 intersections during the Saturday pre-event peak hour. During the weekday pre-event peak hour, the average travel speed on westbound Denny Way from Fairview Ave N to Taylor Ave would be reduced to less than 40% of its free-flow speed, which would be a significant impact. Alternative 1 would also cause traffic exiting both directions of I-5 at Mercer St to queue back toward the mainline. LINK light rail would experience significant impacts due to overcapacity conditions on northbound trains during the weekday pre-event peak hour and southbound trains in the weekday post-event peak hour. Transit is expected to experience significant impacts due to overcapacity conditions on some bus routes, as well as travel time and reliability degradation associated with degraded traffic operations.

Compared to the No Action Alternative, Alternative 1 – Above-Average Seattle Center Attendance would improve the weekday post-event condition related to ridehailing, bicycle travel, and paratransit. However, significant impacts are still expected during the pre-event peak hours because ridehailing vehicles would not have regulated unloading locations. Significant pedestrian impacts are expected at the same intersections identified for the Average Attendance with Alternative 1 condition.

Saturday post-event conditions are expected to be similar to weekday post-event conditions for all modes. While bus frequencies would likely be somewhat less on Saturdays in 2035, it is likely that there would be reserve capacity in the post-event condition. Post-event crowding on LINK light rail would be similar as described for the Average Seattle Center Attendance condition.

Alternative 2: Modified Proposal

This section describes the potential impacts to transportation in 2035 under Alternative 2. The transportation-related assumptions for Alternative 2 differ from Alternative 1 in the following key ways:

- Less underground parking (200 spaces instead of 450 spaces) at the renovated arena.
- Parking before, during, and after events at the 1st Ave N Garage would be capped at 400 spaces.
- Thomas St between 1st Ave N and Warren Ave N would function as a “woonerf” (a street with a raised streetbed where pedestrians and bicyclists have priority over motorists), or urban curbless street as defined in the City’s Right-of-Way Improvements Manual, and would be closed to traffic during events.
- Ridehailing would be regulated such that no pick-ups may occur after events within the area bounded by (and including) Roy St, Dexter Ave N, Denny Way, and Queen Anne Ave N. No regulation of drop-offs would occur.

The travel characteristics (mode share, origin/destination, etc.) of attendees at the renovated arena under Alternative 2 would be the same as under Alternative 1 given their similar proposed transportation conditions and the fact that the arena capacity is the same.

Traffic Operations

Traffic volume forecasts for Alternative 2 are similar to Alternative 1. The differences are focused on the locations where parking would be limited: the garage beneath the arena and the 1st Ave N Garage. Because less parking would be provided in those garages compared to Alternative 1, less traffic is projected in the area immediately south of the arena under Alternative 2. The ridehailing regulations

would also disperse some traffic from the area immediately surrounding the arena to other nearby corridors during post-event conditions.

Average Seattle Center Attendance

The traffic operations findings for Alternative 2 are similar to Alternative 1 in most locations. However, by providing fewer parking spaces south of the arena, the amount of time to empty garages/streets in this area after events would be reduced. While there would be a modest traffic increase on other streets associated with this displaced parking (largely expected to be east or south of Seattle Center), this would most likely occur a considerable distance from the site where parking is available and congestion is less severe. Additionally, with fewer private vehicles traveling to the arena, the number of dispersed vehicles is lower than under 2020 conditions. Similarly, traffic volumes associated with ridehailing activity would be shifted to areas outside the ridehailing pick-up boundary. Therefore, Alternative 2 is expected to result in a slight improvement (relative to Alternative 1) in traffic conditions at intersections adjacent to and south of the arena. However, the intersection LOS degradations identified under Alternative 1 would also occur at most locations with Alternative 2, given their similar travel characteristics. Similarly, Alternative 2 would result in comparable degradations in travel times and freeway off-ramp queues as described for Alternative 1.

Above-Average Seattle Center Attendance

Under Alternative 2 – Above-Average Seattle Center Attendance, conclusions regarding traffic operations would be similar to those described for the Average Seattle Center Attendance condition. However, the relative improvements under Alternative 2 would likely be greater during post-event conditions because traffic would be more dispersed due to the adjacent parking garage capacity limits and restrictions on post-event passenger pick-ups.

Ridehailing

Under Alternative 2, ridehailing drop-offs would occur in those locations most convenient to drivers and passengers rather than in a designated area. However, pick-ups would be regulated using a “geofence,” which is a virtual geographic boundary. Customers that request a pick-up while in the geofence would be limited in where they can meet their car. During pre-determined event times (to be coordinated by Seattle Center and SDOT), a customer requesting a ride from the area bounded by Roy St, Dexter Ave N, Denny Way, and Queen Anne Ave N would have to meet their vehicle outside of that restricted area (i.e., pick-ups could not occur on or within those “boundary” streets). This approach would limit the amount of vehicle traffic in the immediate vicinity of the project site and Seattle Center.

Average Seattle Center Attendance

Under Alternative 2 – Average Seattle Center Attendance, the renovated arena would draw substantial ridehailing activity during events such as an NBA game or concert. Drop-off activity would be similar to that observed during large KeyArena events, which sometimes results in ridehailing vehicles blocking through lanes, bicycle facilities, or bus pullouts, particularly along 1st Ave N. Although ridehailing pick-up locations would not be allowed within the geofence, those ridehailing vehicles may stop in travel lanes, bicycle facilities, or bus pullouts outside that area, causing congestion and blockages to other modes. While ridehailing activity would likely be shifted in all directions, most is expected to shift to the west where the ridehailing boundary is closest to the arena.

Above-Average Seattle Center Attendance

Under Alternative 2 – Above-Average Seattle Center Attendance, ridehailing would occur within a slightly more congested traffic environment. However, findings would be similar to those described for the Average Seattle Center Attendance scenario.

Transit

The transit impact findings described for Alternative 1 in 2035 are also representative of conditions for Alternative 2.

Pedestrian Travel

Alternative 2 would include a woonerf, or urban curbless street, along Thomas St between 1st Ave N and Warren Ave N. This street design would make crossing Thomas St more comfortable for pedestrians due to the decreased conflicts with vehicles.

Alternative 2 would limit the parking capacity at the 1st Ave N Garage to 400 spaces and the capacity in the underground garage to 200 spaces. Under Alternative 2, more than 400 vehicles would need to park farther from the arena than under Alternative 1, requiring passengers to walk longer distances to reach the arena and add volumes on some sidewalks and crosswalks. However, the overall change in volume at any 1 facility is expected to be modest given the large number of alternative parking areas and lower overall private vehicle mode share compared to 2020; therefore, the pedestrian impacts described for Alternative 1 are representative of conditions under Alternative 2.

Bicycle Travel

As described above, Alternative 2 would make crossing Thomas St more comfortable for bicyclists due to decreased conflicts with vehicles. Aside from this benefit, the bicycle impact findings described for Alternative 1 are representative of conditions for Alternative 2.

Parking

Alternative 2 would limit the parking capacity at the 1st Ave N Garage to 400 spaces and the capacity in the underground garage to 200 spaces. Under Alternative 2, more than 400 vehicles would need to be parked in a different location than under Alternative 1. In 2035, the off-street parking occupancies indicate that those vehicles could shift to alternate garages within the same geographic subarea rather than search for parking farther away. With the reduction in parking supply, off-street parking occupancies for Alternative 2 – Average Seattle Center Attendance would be 55% on weekdays and 71% on Saturdays. Off-street parking occupancies for Alternative 2 – Above-Average Seattle Center Attendance would be 64% on weekdays and 75% on Saturdays. These totals represent about a 5% increase over the values for Alternative 1.

Bus/Truck Staging

The charter bus and truck staging impact findings described for Alternative 1 are also representative of conditions for Alternative 2.

Paratransit

The paratransit impact findings described for Alternative 1 are also representative of conditions for Alternative 2.

Safety

The safety impact findings described under Alternative 1 are also representative of conditions for Alternative 2.

Summary of Transportation Impacts in 2035 – Alternative 2

Impacts to the transportation system under Alternative 2 would be similar to those identified for Alternative 1. The differences relate to traffic operations, ridehailing, and both on-street and off-street parking. Due to the dispersed traffic caused by limiting off-street parking south of the arena and the ridehailing regulations, there would be fewer and/or less severe impacts at locations immediately surrounding the arena, particularly on the south side.

The significant impact findings described under Alternative 1 related to ridehailing during the pre-event peak hours are also representative of conditions under Alternative 2. During the post-event peak hour, the ridehailing activity would shift to nearby corridors, where impacts are expected due to blocked travel lanes, bicycle facilities, and/or bus pullouts. Given the substantial increase in ridehailing mode share in 2035 compared to 2020, there could be potentially significant adverse impacts related to blocked travel lanes or bicycle facilities just outside of the geofence.

The decreased off-street parking supply adjacent to the renovated arena would create more competition for on-street and off-street parking. However, patrons would find alternative parking locations within the parking study area. On-street parking occupancy levels on weekdays and Saturdays suggest that a substantial number of vehicles would circulate for multiple blocks looking for parking and increasing conflicts with other modes; this would be a significant impact. Because paid parking and time limits are not in effect on Sundays, parking impacts are also expected on Sundays.

2035 Summary of Significant Impacts by Alternative

The following table summarizes the significant impacts identified for Alternatives 1 and 2.

Table 4-38. 2035 Summary of Significant Impacts by Alternative

Mode	No Action Conditions	Significant Impacts	
		Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Traffic Operations	LOS E/F intersections: • *Average Seattle Center Attendance*: 46 weekday pre-event, 1 weekday post-event, and 6 Saturday pre-event. • *Above-Average Seattle Center Attendance*: 52 weekday pre-event, 5 weekday post-event, and 7 Saturday pre-event. Slow eastbound speeds on Mercer St and Denny Way.	Impacted intersections: • *Average Seattle Center Attendance:* 23 weekday pre-event, 19 weekday post-event, and 7 Saturday pre-event. • *Above-Average Seattle Center Attendance:* 12 weekday pre-event, 20 weekday post-event, and 9 Saturday pre-event. Speed impact on westbound Denny Way. Queues spill back onto I-5 mainline at Mercer St.	Modestly improved traffic operations adjacent to arena because of dispersal of traffic volumes due to off-street parking limits. Same as Alternative 1 beyond arena site.

Mode	No Action Conditions	Significant Impacts	
		Alternative 1: OVG Proposal	Alternative 2: Modified Proposal
Ridehailing	Increased ridehailing activity in 2035. Unregulated pick-up/drop-off system may cause blockages before and after large events.	Impacts to transit, bicycles, and safety before events due to the potential of unregulated drop-offs that block facilities. No impacts and improved conditions after events due to designated pick-up locations.	Impacts to transit, bicycles, and safety before events due to the potential of unregulated drop-offs to that block facilities. No impacts after events because activity is dispersed from arena.
Transit	Transit speed and reliability affected by unacceptable traffic operations and ridehailing pick-up/drop-off activities. Sufficient total bus and LINK capacity though many routes have standing room only. Ample Monorail capacity. Occasional transit blockages by ridehailing vehicles.	Transit speed and reliability impacted by poor traffic operations and ridehailing drop-off activities. Crowding impacts on northbound LINK before weekday events and southbound LINK after events. Bus stop blockage impact from ridehailing before events; improved conditions after events (see ridehailing section).	Same as Alternative 1.
Pedestrian	Generally acceptable with occasional capacity issues during large events.	Impact at 5th Ave N/Harrison St crosswalk and crossings to LINK station.	Impact at 5th Ave N/Harrison St crosswalk and crossings to LINK station. More comfortable to cross Thomas St due to woonerf.
Bicycle	Occasional blockages caused by ridehailing vehicles during large events.	Bicycle facility blockage impact from ridehailing before events; improved conditions after events (see ridehailing section).	Impact from ridehailing before events; improved conditions after events (see ridehailing section). More comfortable to cross Thomas St due to woonerf.
Parking	Overall sufficient capacity with higher on-street occupancies than off-street occupancies.	Impacts due to modal conflicts caused by motorists circulating for parking (high occupancy levels would cause more cruising for parking).	Same as Alternative 1.
Charter Bus/ Truck Staging	Accommodated via Curbside Management MOA.	None.	Same as Alternative 1.
Paratransit	Accommodated in existing passenger loading zones.	No significant impacts expected, although there could be delays in curb space availability caused by ridehailing in the pre-event period.	Same as Alternative 1.
Safety	Occasional, temporary effects from ridehailing vehicles.	Modal conflict impact from ridehailing before events; improved conditions after events.	Same as Alternative 1.

4.5 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

4.5.1 Construction

This section describes strategies to reduce the magnitude of the construction impacts to the transportation system. Most of these measures will be developed as part of the permitting process with the City. Construction mitigation measures would be the same for both action alternatives.

Street Use Permits and Other Agreements

SDOT issues street use permits when construction activities encroach and impact the ability to use the public right-of-way. Through the street use permitting process, SDOT seeks to accommodate construction activities and maintain the mobility functions of the right-of-way. As part of the street use permitting process and the development of other agreements, it is recommended that SDOT, Seattle Center, and OVG identify the following measures to reduce the significance of the construction-related transportation impacts:

- An adequate location for a temporary King County Metro bus layover facility to replace the layover space at the north end of the arena plaza. Potential locations could include Republican St just east of 1st Ave N or Warren Ave N just north of Republican St. Both locations would result in the loss of some on-street parking spaces and would require coordination with King County Metro and Seattle Center.
- A temporary bus stop to replace the stop just north of John St along 1st Ave N. Potential locations could include the stop just south of Republican or just north of Denny Way. This may result in the loss of additional on-street parking and would require coordination with King County Metro.
- Temporary bicycle lane accommodations to replace any loss of the on-street bicycle lane along 1st Ave N between John St and the north edge of the arena plaza. Potential alternatives could be shifting the lanes along 1st Ave N to the west to accommodate all existing bicycle and vehicle lanes. This could also be designed as a protected bicycle lane along the west side of the street. This would require the temporary loss of on-street parking and may require traffic signal modifications.
- A plan to ensure adequate pedestrian access through the construction zone. This could require a safe pedestrian pathway to be accommodated along Thomas St between 1st Ave N and 2nd Ave N, or an alternative pathway with appropriate detour signage. Additionally, improved pedestrian crossings, an alternative pathway (which could require the shifting of bicycle and travel lanes to the west), or advanced signage to accommodate pedestrian travel along 1st Ave N between John St and Republican St.
- A construction parking plan to replace lost parking during construction. Potential accommodations could include an agreement for construction workers to park outside of the area (more than 0.5 mile) and shuttle in, or an agreement to keep a minimum number of spaces within the 1st Ave N garage open during Seattle Center events.
- Revise the Curbside Management MOA between SDOT and Seattle Center to accommodate construction activities, events, and loading needs for Seattle Center. Examples include 1-way

operations of Thomas St to allow continued curb space use between Warren Ave N and 2nd Ave N, or identification of new curb space in the immediate vicinity that Seattle Center can use (along with necessary accommodations to address neighborhood parking impacts). See Appendix B, Tables B-3 through B-5 for a list of events/performances that rely on curb space reservation via the MOA.

Construction Management Plan

Prior to the issuance of any grading or demolition permits, OVG would work with SDOT, Seattle Center, King County Metro, and SDCI to prepare a Construction Management Plan (CMP). The plan should include (but not be limited to) items such as:

- Guidance on the number and size of trucks per day entering and leaving the project site.
- Identification of arrival/departure times that would minimize traffic impacts.
- Approved truck circulation patterns.
- Locations of truck staging areas.
- Locations of employee parking and methods to encourage carpooling and use of alternative transportation.
- Methods for partial/complete street closures (e.g., timing, signage, location and duration restrictions).
- Criteria for use of flaggers and other traffic controls.
- Preservation of safe and convenient passage for bicyclists and pedestrians through/around construction areas.
- Monitoring for roadbed damage and timing for completing repairs.
- Limitations on construction activity and parking restrictions during peak/holiday weekends and special events.
- A point of contact for nearby residents and businesses (OVG Community Liaison) to obtain construction information, have questions answered, and convey complaints.

4.5.2 Operations

This section describes strategies to reduce the magnitude of the operations impacts to the transportation system. Mitigation measures would be the same for both action alternatives.

Measures for Traffic Operations Impacts

The following measures are recommended to mitigate the potential traffic operations impacts identified in this EIS analysis. Final mitigation measures will be determined by SDOT, SDCI, and Seattle Center.

- OVG would work with Seattle Police Department, SDOT, SDCI, King County Metro, and Seattle Center to develop and implement an Event TMP. The Event TMP would identify street/lane closures, placement of traffic control officers (TCOs), special signal timings, curb space management, specified locations for ridehailing pick-up/drop-off activity with supportive programming and enforcement, and placement of temporary signage and equipment (e.g.,

barricades, portable signs, changeable message signs, etc.). The Event TMP would include attendance thresholds that consider both the arena and other events at Seattle Center, which would identify a range of management strategies that become increasingly expansive as the combined attendance levels at the arena and Seattle Center increase. The Event TMP would include performance metrics that describe the intended effectiveness of the program. It would also describe a periodic monitoring program to measure its performance. The Event TMP would be updated as-needed (e.g., annually or biennially) based on the results of the monitoring program and changing traveler preferences and events at the arena.

- OVG would work with SDOT, SDCI, and King County Metro to develop an Event Transportation Demand Management Plan (DMP) to reduce the number of private auto and ridehailing trips to the arena to reduce the traffic impacts associated with these modes of travel. The DMP could contain thresholds/targets like private auto/ridehailing mode shares or total pre-event/post-event peak hour vehicle trip targets. To achieve these goals, the DMP could include incentives like subsidized transit/Monorail/bike share passes, first/last mile access to major transit hubs, and incentives for ridesharing. In addition, regulatory/pricing mechanisms could be employed (some of which would need to be managed by the City) including, but not limited to, minimum parking fees at arena-controlled garages, peak period ridehailing surcharges, and reservation-based parking bundles at remote parking facilities with a shuttle/transit pass/bike share credit. The DMP would include strategies for both arena attendees and employees. Employee demand management strategies could include subsidized transit passes, carpool matching services, a requirement that employees pay full market rate for off-street parking, and a commute trip reduction program manager. When developing an employee DMP, it may be beneficial to coordinate with Seattle Center to determine if a larger-area employee DMP can be developed that covers both arena and Seattle Center employees. Specific performance metrics and targets would be defined in the DMP and a periodic monitoring program would also be defined. It recommended that the DMP be updated annually to respond to changing travel preferences, transit system changes, and events at the arena. To accommodate the additional patron and employee demand for non-auto travel, some capital investments could also be identified in the DMP. Examples include bicycle and pedestrian wayfinding signs, and improved transit passenger amenities.
- OVG would work with SDOT to improve traffic flow and pedestrian progression at the 1st Ave N/Thomas St and 1st Ave N/John St intersections. This is primarily an issue in post-event conditions. Improvements could include new traffic signals to be funded by OVG. These signalized intersections should include marked crosswalks on all approaches, pedestrian signal countdown heads (i.e., remaining seconds of the flashing “don’t walk” phase are shown), and “blank out” signs installed on poles and mast arms where necessary to advise motorists of temporarily prohibited turn movements to avoid pedestrian conflicts. These signalized intersections would be interconnected with adjacent traffic signals on 1st Ave N to the north and south to allow for coordinated signal operations. Alternatively, these intersections could be manually controlled.
- OVG would work with SDOT to investigate opportunities for improving pre- and post-event traffic operations impacts on affected area roadways like Mercer St, Denny St, 1st Ave N, Queen Ave N, 5th Ave N, Dexter Ave, Westlake Ave, Fairview Ave, etc. Potential improvements could include new traffic signal timing plans, implementation of adaptive signal control, “blank out” signs to temporarily restrict turning movements, red light cameras to improve compliance of keep-clear areas, etc. OVG would work with SDOT to make a fair-share contribution to these traffic control improvements.

- OVG would work with SDOT and WSDOT to investigate opportunities to monitor and potentially reduce off-ramp queuing from Mercer St onto I-5. A review of the Vissim model indicates that simple fixes like traffic signal retiming would not be successful because SDOT already operates the SCOOT adaptive traffic signal system on the corridor and it is processing a high volume of traffic. Potential solutions include directions to the arena that include alternative routes to area garages (Stewart St, Seneca St, etc.), a garage reservation system that includes customized directions to the garages that avoid Mercer St, free transit tickets and directions to regional park-and-ride lots as part of a game/event ticket, and free Monorail ticket with directions to Downtown and Westlake area parking and transit options. A successful DMP would also reduce the likelihood of queue spillback at the Mercer St off-ramp.
- OVG will employ a Community Liaison to coordinate with Seattle Center regarding event scheduling logistics. Seattle Center is home to multiple organizations that regularly host performances and events beginning in the same window of time as proposed arena events. In past years, Seattle Center has encouraged cooperation between these organizations to stagger event start times when possible and to plan for traffic officers at congested locations when multiple events start or end simultaneously.

Measures for Ridehailing Impacts

The following measures are recommended to mitigate the potential ridehailing impacts identified in this EIS analysis.

- OVG would work with Seattle Police Department, SDOT, SDCI, King County Metro, and Seattle Center to develop, implement, and periodically update an Event TMP and DMP. The Event TMP could identify the placement of TCOs, curb space management among ridehailing and other modes, specified locations for ridehailing pick-up/drop-off activity with supportive programming and enforcement, and placement of temporary signage and equipment (e.g., barricades, portable signs, changeable message signs, etc.). In particular, the TMP could address pre-event drop-off congestion along 1st Ave N (and other locations identified after the arena begins operations) that could result in modal conflicts from drop-offs that might occur in the travel lanes, bicycle facilities, or transit stops. TCOs could be on-site to ensure appropriate use of the curb space. The DMP is integral to the successful management of ridehailing vehicles and their adverse transportation impacts. The DMP could identify a target ridehailing mode share or number of ridehailing trips that reduce the traffic operations impacts from this mode and the potential modal conflicts that arise from pick-ups and drop-offs.

Measures for Bicycle Impacts

To address potential impacts to bicycle facilities, the following mitigation is recommended:

- To accommodate potential bicycle parking, it is recommended that OVG provide at least 200 free short-term bicycle parking spaces during high-attendance events like sports events or concerts. This amount of bicycle parking could accommodate the expected 1% of bicycle event arrivals for large events. Bicycle parking could be accommodated with unattended racks or a valet program. Some of the bicycle parking could accommodate bike share cycles. As part of the periodic TMP/DMP review process, OVG could recalculate the amount of bicycle parking provided as modal preferences change. OVG could also work with the bike share providers to ensure there are adequate bicycles after an event to meet demand and that the bicycles are

distributed around the arena (but out of the right-of-way) to ensure convenient access to the bicycles. OVG could also provide a minimum of 25 long-term covered, secure, and well-lit bicycle parking spaces for arena employees. Shower facilities could also be included on-site for employees.

- OVG would work with SDOT to implement bicycle improvements along 1st Ave N to address the modal conflicts between drop-offs and bicycles in front of the arena. Improvements could include a protected bicycle lane on the west side of the roadway.
- OVG would work with SDOT to implement other bicycle safety projects that arise from increased modal conflicts between bicycles and arena traffic. In particular, intersections with high turning vehicle conflicts could benefit from capital improvements like curb bulbs, temporary turning restrictions, or management strategies like temporary crosswalk closures, traffic control officers, etc.

Measures for Pedestrian Impacts

The following measures are recommended to mitigate the potential impacts to pedestrian facilities:

- OVG would work with SDOT to improve the pedestrian crossing at the 5th Ave N/Harrison St intersection to accommodate heavy pedestrian flows during pre- and post-event conditions. Recommended improvement would be to widen the crosswalk from 11 feet to 15 feet, or signal retiming or manual traffic control.
- OVG would work with SDOT to improve pedestrian crossings of Thomas St between 1st Ave N and Warren Ave N. Examples of potential pedestrian improvements could include a woonerf or festival street that features a curbless design and is closed to vehicles during the pre- and post-event peak hour or a “tabled” intersection at Thomas St and Warren Ave N. Improvements could also include an all-way stop at Thomas St/Warren Ave N or manual traffic control. This mitigation would not apply to Alternative 2 because it incorporates a woonerf design for Thomas St between 1st Ave N and Warren Ave N.
- OVG would work with SDOT to identify intersection corners that are subject to crowding and would benefit from curb extensions or barricades to reduce the risk of pedestrians spilling into the intersection during the pre- and post-event conditions. Potential intersections that could benefit from additional corner space or barricades include, but are not limited to: the NW corner of Harrison St/5th Ave N, the SW corner of Mercer St/1st Ave N, the NW corner of Harrison St/1st Ave N, and the NW and SW corners of Republican St/1st Ave N.
- OVG would work with SDOT to implement other pedestrian safety projects that arise from increased modal conflicts between pedestrians and arena traffic. In particular, intersections with high turning vehicle conflicts could benefit from capital improvements like curb bulbs, temporary turning restrictions, or management strategies like temporary crosswalk closures, traffic control officers, etc.

Measures for Transit Impacts

The following measures are recommended to mitigate the potential impacts to transit crowding and speed and reliability:

- OVG would work with King County Metro and other transit providers to determine whether additional bus route service could be provided to the arena on days with large events, and fund

that service if warranted. Service could include both routes that directly serve the arena and regional routes that serve Westlake Station (e.g., routes that access regional park-and-ride lots). To accommodate this additional service, OVG would work with King County Metro to identify additional passenger accommodations or bus layover space. A substantial amount of lead-time is required to implement additional transit service, so early coordination would be required.

- OVG would coordinate with Seattle Center Monorail and Sound Transit to determine the need for OVG to fund high-capacity service to accommodate surges in pre-event and/or post-event riders during large events.
- OVG would work with SDOT and King County Metro to identify and implement transit speed/reliability/pedestrian amenity capital improvements to address pre-event and post-event traffic congestion that slows bus service around the arena and high demand for transit caused by events. Routes that use Queen Anne Ave N, 1st Ave N, 5th Ave N, and Denny Way are most likely to require speed/reliability improvements. Improvements could include reconfiguration of parking/travel lanes to accommodate bus-only lanes, transit signal priority, queue jump lanes, revised transit stops/shelters, bus bulbs, pedestrian lighting at shelters, etc. SDOT and King County Metro would identify OVG's proportionate fair share contribution toward these improvements.
- OVG would work with SDOT and King County Metro to address potential bus stop crowding during the post-event peak period at the bus stops along Queen Anne Ave N south of Harrison St and John St. Potential improvements could include removal of existing transit shelters and replacement with canopies to clear obstructions on the sidewalk. New benches toward the back of the sidewalk could also be installed. This mitigation is similar to what was recently built at the stop along Queen Anne Ave N south of Mercer St.

Measures for Parking Impacts

To address potential modal conflicts caused by reduced on- and off-street parking supply, the following mitigation measures are recommended:

- OVG would work with SDOT, Seattle Center, and private garage owners/operators to develop an "Off-Site Parking Facility Reservation and Best Practices System." This system could allow attendees to reserve parking in advance of an event via a website or mobile app. This system can be operated so that parking occupancy can be managed (and limited if necessary) to enable post-event traffic to be able to exit the garage in a reasonable period of time and to spread traffic impacts to areas with more capacity, like Downtown/Westlake Center. Private garage owners/operators may opt into this reservation system, provided they agree to operate their garages during events according to a series of "best practices," which include ways to minimize pre-event queuing to enter the garage, accommodation of pedestrians walking across garage driveways, and maximum occupancy levels to ensure adequate surrounding traffic operations. Garages could include sites beyond the study area if they have convenient access to transit or shuttle service. The garages around Westlake Center are potential candidates given the Monorail and frequent transit along 3rd Ave. Monorail tickets should be bundled with any parking near Westlake Center.
- OVG would work with SDOT to improve the availability of real-time off-street parking garage information to arena attendees. This could be achieved by expanding the City's ePark guidance system through additional participating garages and new dynamic message signs installed in the vicinity of the arena.

- OVG would work with SDOT to explore and implement improvements to the on-street parking management program in the area. Examples of potential changes to on-street parking management could include changes to the Restricted Parking Zone (RPZ) boundaries, modifications to the hours where paid parking is enforced, new paid parking areas, implementation of paid parking on Sundays, or parking fee changes.
- OVG would work with SDOT and Seattle Center as they revise and update the MOA for Event Curbside Management around Seattle Center to address the needs for charter bus/truck staging for events at the renovated arena, recognizing the existing use of the curbside for Seattle Center events.
- As part of the DMP for employees at the arena (and potentially Seattle Center as well), alternative remote lots could be included to reduce the amount of parking consumed by arena employees during events. A shuttle program may be required to access the remote lots if transit does not provide a frequent connection (this may be an issue in the post-event condition when transit service in the area is less frequent).

4.6 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS TO TRANSPORTATION

This section summarizes the significant and unavoidable adverse transportation impacts for both construction and operations of the proposed arena.

4.6.1 Construction

There are potential construction-related transportation impacts to pedestrian and bicycle safety, and bus/truck staging areas. The proposed mitigation measures would adequately address all of the construction-related transportation impacts so that they are reduced to a less-than-significant level.

4.6.2 Operations

The extensive mitigation measures proposed above would reduce the magnitude of all transportation impacts. The background growth in the area, coupled with the large number of events (number of days an event would occur), and large number of attendees would result in significant and unavoidable adverse impacts to traffic operations, transit, and parking during major events (NBA/NHL and large concerts/events) at the renovated arena. In other words, there would be noticeably more traffic congestion and transit delays during large events at the renovated area compared to the No Action Alternative, even with the extensive mitigation program implemented. This degree of impact would occur on many more days during the year than under the No Action Alternative because the renovated arena would attract higher-profile events like NBA/NHL games and larger concerts than can be accommodated by KeyArena. While an extensive program to manage parking demand and direct patrons to less-congested parking areas is recommended, there is no guarantee that the numerous private parking operators in the area will work with OVG to coordinate parking demand and the associated modal conflicts caused by patrons cruising for available on or off-street parking.

With the TMP and DMP, impacts related to ridehailing, pedestrian, bicycle, and safety are expected to be brought to a less-than-significant level during pre-event and post-event conditions.

5.0 EARTH

Geology, soil, and groundwater considerations important to the project include the underlying geological characteristics and properties of subsurface materials, soil characteristics, and hydrogeology, as well as seismic and other related geotechnical hazards. Regional geology and seismicity would not change as a result of the project, but they influence how the project is designed and constructed. These considerations affect the type of construction methods used for the project and, if not adequately considered during project design, could affect the long-term safety of the project. Any dewatering activities from the project could also have an impact on groundwater levels in the area. Analysis in this chapter focuses on erosion, slope failure, seismic hazards, liquefaction, unstable soils, and groundwater.

Key Findings for Earth

Construction would require substantial quantities of earthwork, which if not adequately designed and implemented, could create safety hazards for construction workers. Compliance with excavation safety standards and shoring requirements would ensure that construction impacts are minor. Seismic and geotechnical hazards, including ground shaking, liquefaction, slope stability, and other hazards, would be addressed through a final design-level geotechnical analysis and report. Impacts would be minor with implementation of final geotechnical recommendations in accordance with regulatory requirements.

5.1 METHODS

Potential impacts were determined by identifying the geologic, soils, and hydrogeologic conditions at the project site and vicinity, and evaluating how the proposed improvements might be affected for both the construction and operation phases. Existing conditions related to seismicity were obtained from a number of sources, including publicly available information from the Washington Department of Natural Resources (WDNR, 2004) and a peer-reviewed Geological Society of America paper (Troost and Booth, 2008). In addition, site-specific conditions were based on boring logs completed as part of a preliminary geotechnical investigation for the project by Hart Crowser geotechnical engineers in 2017 (Hart Crowser, 2017), and the Draft Geotechnical Engineering Design Report (Hart Crowser, 2018).

5.2 REGULATORY CONTEXT

Washington State's Growth Management Act (GMA) (RCW Chapter 36.70A) requires all cities and counties to identify critical areas within their jurisdictions and to formulate development regulations for their protection. Among the critical areas designated by the GMA are geologically hazardous areas, which are areas susceptible to erosion, sliding, earthquake, or other geologic events. These hazards could affect the design, construction, and operation of the project and, if not considered appropriately, could pose a risk to public safety.

The Washington State Building Code Council (SBCC) was created to advise the Legislature on building code issues and to develop the building codes used in Washington State. These codes ensure that buildings and facilities constructed in the state are safe and healthy for building occupants, workers, and the public. The State Building Code is modeled on the 2015 International Building Code and other

national model codes that are adopted by reference and combined with Washington State Amendments.

In accordance with the GMA, each city must include codes regulating development in or near geologically hazard areas. These policies and codes require measures to address hazards such as liquefaction or unstable fill materials unless a geotechnical investigation can demonstrate feasibility with recommendations for appropriate site preparations and foundation design. Other hazards such as erosion and groundshaking are addressed through implementation of regulatory requirements (e.g., National Pollutant Discharge Elimination System [NPDES]) and building code standards that include seismic design measures, while erosion hazards are typically addressed through drainage control requirements both during construction and post-construction.

Construction dewatering discharge to the sewer system is permitted through the King County Department of Natural Resources and Parks/Industrial Waste Program under King County Ordinance No. 11-34 (Document Code No. PUT 8-14 (PR)).

The SMC contains specific provisions that describe the scope of the SEPA analysis for the earth element. Relevant policies from SMC 25.05.675 generally provide that the City's policy is to protect life and property from loss or damage from landslides, strong ground motion, liquefaction, soil creep, settlement/subsidence, erosion, and other hazards related to earth movement and instability. SMC 25.05.675 also provides the authority to apply mitigation measures to reduce impacts related to earth movement or instability.

5.3 AFFECTED ENVIRONMENT

5.3.1 Geologic Setting

The greater Seattle area is part of the Puget Sound Lowland, an elongate structural and topographic basin between the Cascade Range to the east and the Olympic Mountains to the west. The Puget Sound Lowland area has been affected by repeated glaciation in the past 2.4 million years, along with crustal deformation related to the Cascadia subduction zone. The present landscape has been formed by repeated cycles of glacial scouring and deposition, tectonic activity, landsliding, stream erosion and deposition, volcanic mudflows, and also human activity (Troost and Booth, 2008).

Tectonic deformation associated with the subduction zone results in a north-south shortening producing east-west trending folds and faults. Three major bedrock structures characterize the greater Seattle area, which include (from south to north) the Seattle uplift, the Seattle fault zone, and the Seattle basin. The Seattle fault zone is an approximately 4-mile wide zone that runs east-west across the south part of the city. During a large earthquake about 1,100 years ago, land north of the fault subsided by as much as 3 feet, and areas south of the fault uplifted as much as 20 feet (Troost and Booth, 2008). The surface rupture that occurred 1,100 years ago resulted from an estimated moment magnitude (Mw) 7.5 earthquake. The estimated probabilities of an earthquake with a magnitude of greater than magnitude (M) 6.5 occurring on the Seattle fault zone or another shallow-crustal source in the Puget Sound region are approximately 5% in 50 years (also referred to as a 1,000-year recurrence

Moment magnitude (Mw) is related to the physical size of a fault rupture and movement across a fault. Moment magnitude provides a physically meaningful measure of the size of a faulting event, whereas the Richter Magnitude (M) is a relative measurement of an earthquake to the reference 3.0 earthquake.

interval) to as much as 15% in 50 years (333-year recurrence interval). These probability estimates have large uncertainties due to the limited data.

The surficial deposits of Seattle are generally grouped into the following categories: postglacial deposits, late glacial deposits, Vashon glacial deposits, pre-Vashon deposits, and bedrock. Most of these deposits are fine-grained but also include coarser-grained deposits (Troost and Booth, 2008). According to a liquefaction susceptibility map produced by the Washington Department of Natural Resources (WDNR), the project site is in an area with a very low to low potential for liquefaction (WDNR, 2004).

King County has 5 groundwater management areas (GWMAs) within the county boundaries: East King County, Issaquah Creek Valley, Redmond Bear Creek Valley, South King County, and Vashon-Maury Island. The project site is north of the South King County GWMA and outside of any GWMA boundary. Groundwater in the region is not a potable source of water supply. Water supply in the region is provided from the Cedar River and Tolt River watersheds and delivered across the region by a network of pipelines.

5.3.2 Geology, Soils, and Groundwater at the Project Site

Soils at the project site have been reworked and disturbed by previous development and are no longer in their native condition. According to the boring logs completed as part of the preliminary geotechnical investigation, the project site is underlain by approximately 10 to 30 feet of artificial fill that consists primarily of poorly graded silty sand (Hart Crowser, 2017 and 2018). The fill material is underlain by sequences of gravels, sands, and silts with varying sediment sizes that are generally dense or stiff. Below this layer is a unit of very stiff to hard fine-grained deposits at depths of 60 to 80 feet below ground surface.

Groundwater was encountered in the borings at depths ranging from approximately 23 to 32 feet below ground surface (elevation of between 95 and 105 feet North American Vertical Datum of 1988 [NAVD88]). The boring explorations went to a maximum depth of 186 feet below ground surface, and no bedrock was encountered. These observations are consistent with previous borings conducted in 1994 for the previous arena renovation but may not be representative of natural conditions due to the drainage system at the site (Hart Crowser, 2018). In general, saturated, loose unconsolidated materials are potentially liquefiable if encountered within 50 feet of ground surface. Groundwater is present at depths within 50 feet; however, the density of the sandy layers and other conditions present at the site indicate that the potential for liquefaction and liquefaction-induced hazards is very low (Hart Crowser, 2018).

5.4 POTENTIAL IMPACTS

Impacts can be short-term related to construction activities, or long-term related to the permanent structure and operation of the project.

5.4.1 Construction Impacts

The magnitude of the potential construction (short-term) impacts to earth resources from the project would be characterized as significant if the impacts meet the definition below. Impacts that do not reach this threshold are characterized as less-than-significant.

Criteria for Significant Construction Impacts: Significant impacts on earth resources could occur if the project construction resulted in substantive injury or death to workers or visitors or damage to the proposed or adjacent improvements during or following construction, and as such would not meet applicable regulatory requirements and industry standards for construction. Significant impacts would also occur if substantive changes to hydrogeologic conditions (including a temporary lowering of the groundwater table) would result from construction.

No Action Alternative

There would be no construction impacts, as no construction would occur under the No Action Alternative.

Alternative 1: OVG Proposal

Erosion. Alternative 1 would result in a less-than-significant impact for erosion associated with construction activities. Alternative 1 would disturb more than 1 acre and thus is required to obtain a General Construction Permit through the NPDES program. Such projects must include construction best management practices (BMPs), as detailed in a Stormwater Pollution Prevention Plan (SWPPP). These BMPs are developed on a project-specific basis and may vary depending on the activities involved. Typical examples of construction BMPs include the installation of silt fences, use of hay bales, covering trucks that haul soils, or application of soil stabilization measures that are designed to minimize the potential for erosion on exposed areas. In general, these water quality and construction BMPs are effective in minimizing erosion and the loss of topsoil such that additional protection measures are not necessary.

Slope Failure. Alternative 1 would conform with existing building code requirements, which would result in a less-than-significant impact for excavation activities during construction. Construction activities would involve substantive earthwork, including excavation, tunneling, grading, and stockpiling of soils. Excavation for the subterranean levels of the arena would extend approximately 15 feet below the current floor level, which if not managed appropriately could be susceptible to caving and slope instability or cause vibration to levels that damage nearby improvements or property. An estimated 500,000 cubic yards would be excavated as part of the renovation. The access tunnel under Bressi Garage would be constructed by auguring, a tunnel boring machine, or potentially through an open cut trench, which would also generate soils for disposal. Off-site disposal would result in temporary truck traffic, dust, road runoff, and other indirect construction-related impacts. In addition, any stockpiled soils could become exposed to winds and water flows that can result in soil erosion or loss of topsoil.

Excavation safety standards for construction work are defined in WAC 296-155 Part N (Excavation, Trenching, and Shoring). Part N applies to all open excavations including trenches, which shall not damage underground installations, surface improvements, or adjacent structures. Excavations that are classified as trenches are required to have a safety system. Additional requirements for safety systems that apply to adjacent structures including monitoring for vibration are defined in WAC 296-155 Part Q (Underground Construction). A registered professional engineer is responsible for ensuring that adjoining buildings, walls, sidewalks, pavement, and appurtenant structures are not undermined or otherwise damaged by vibration, and are adequately supported with shoring, bracing, or underpinning.

Excavation Hazards

Deep excavations can leave sidewalls susceptible to instability; however, excavation safety standards required by WAC 296-155, which require shoring safety standards, would be implemented to minimize those hazards.

Shoring is a means of supporting the earth in a trench or vertical cut for building and roadway construction or other underground installation activities. There are many types of shoring and ground support techniques for earth reinforcement or support of excavations. A properly installed shoring system for excavation is critical for maintaining the structural integrity of the adjacent roadway structures and underground utility infrastructure. Construction work would begin with the installation of earth retention systems including soldier piles immediately outside of the foundation walls at the perimeter of the existing arena to support the roof structure during excavation. The City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction (Standard Specification 2-04) also provide specific information on general trench shoring requirements (City of Seattle, 2014). Adherence to these stringent excavation and shoring requirements would protect adjacent structures and improvements and minimize sidewall instability hazards.

Seismic Hazards. Adherence to building code and regulatory requirements would reduce potential seismic hazards during construction to less-than-significant levels. Seismic activity will likely occur during the life of the proposed improvements and could include the construction period. A seismic event could be substantial, resulting in significant damage, injury, and death, if the construction activities and facilities are not designed appropriately. Grading and construction would adhere to the specifications, procedures, and site conditions contained in the final design plans, which would fully comply with the seismic recommendations of the State Building Code (based on the 2015 International Building Code) and any local building code amendments. Construction methods and employee and site safety measures would also be implemented in accordance with applicable regulatory standards.

Liquefaction. Site preparation measures as determined in a final design-level geotechnical report would further reduce identified potential liquefaction impacts during construction, which are expected to be less-than-significant. Liquefaction of soils during an earthquake could result in substantive damage and injury if improvements are not designed appropriately. The liquefaction potential of the site would be confirmed during the geotechnical investigation of the site as required by law, but the site is mapped in an area with very low to low potential for liquefaction, confirmed by the geotechnical investigation (WDNR, 2004; Hart Crowser, 2018).

Unstable or Unsuitable Soils. Similar to the liquefaction hazards described above, unstable or unsuitable soils would be addressed during the site preparations in accordance with the findings of the geotechnical report. Existing soils at the site include artificial fill, which could be unsuitable for use as structural fill. Removal of any identified soils not suitable for the proposed improvements would occur during excavation activities. Therefore, implementation of the construction measures within the final design-level geotechnical report consistent with current building code requirements would reduce potential impacts related to unsuitable soils to less-than-significant levels.

Groundwater. Some temporary dewatering would likely be needed during construction, which may result in changes to groundwater patterns, potentially causing any off-site contaminants, if present, to migrate onto the project site. However, considering the temporary nature of the dewatering, and permit requirements for dewatering, it would cause less-than-significant impacts to groundwater quality.

Alternative 2: Modified Proposal

Alternative 2 would require the same amount of excavation as Alternative 1, and be susceptible to similar excavation stability hazards. As with Alternative 1, the existing excavation safety standards would apply and with oversight by a registered geotechnical engineer, there would no change in impact

severity compared to Alternative 1. Conformance to current excavation and building code requirements would reduce potential impacts to less-than-significant.

5.4.2 Operations Impacts

Potentially significant operations impacts on earth resources are defined as follows. Impacts that do not reach this threshold are characterized as less-than-significant.

Criteria for Significant Operations Impacts: The magnitude of the potential operations impacts to geology and soils from the project would be significant if operation of the project could cause earth-related hazards that could cause substantive injury or death to occupants and visitors, or damage to the proposed or adjacent improvements following construction, and as such would not meet applicable regulatory requirements and industry standards. Significant impacts would also occur if substantive changes to hydrogeologic conditions (including a permanent lowering of the groundwater table) would result from the project, causing a change to groundwater flow patterns.

No Action Alternative

There would be no long-term impacts on earth resources under the No Action Alternative.

Alternative 1: OVG Proposal

Erosion. Redevelopment of the site could alter drainage patterns and potentially expose soils to the erosive effects of wind and water. However, once the project is constructed, the site would continue to be largely covered in impervious surfaces with some minor vegetated landscaping, and would not result in a substantial change from existing conditions; the potential impact would be less-than-significant.

Slope Failure. Unstable soils or subgrade walls could result in failure of some structures or parts of structures. Following construction, the risk of instability of the excavated sidewalls would be eliminated by completion of the retaining walls and foundation improvements. The foundation improvements would be designed and constructed in accordance with the final design parameters consistent with the final geotechnical recommendations and with current building code. The project site is otherwise located in a developed area with relatively gentle topography that is not susceptible to slope instability. As a result, the project would not be susceptible to damage from slope instability during operation, and the potential impact would be less-than-significant.

Seismic Hazards. Seismic activity will likely occur during the life of the proposed improvements and could be substantial, resulting in significant damage, injury, and death, if the facilities are not designed appropriately. The proposed improvements (including site preparation, foundation design, walkways, and utility connections) would be required to be designed in accordance with a final design-level geotechnical report prepared by a Washington-licensed geotechnical engineer. The final design-level geotechnical report would include recommendations to design the project facilities to withstand probable seismically induced ground shaking in accordance with the seismic design criteria contained in the current building code. Grading and construction would adhere to the specifications, procedures, and site conditions in the final design plans, which would fully comply with the seismic recommendations of the State Building Code and local building code amendments. Adherence to these building code requirements would reduce potential seismic hazards to less-than-significant levels.

Liquefaction. Liquefaction of soils during an earthquake could result in substantive damage and injury if improvements are not designed appropriately. The liquefaction potential of the site would be confirmed

during the geotechnical investigation of the site as required by law, but the site is in an area with very low to low potential for liquefaction (WDNR, 2004). Design of structures to resist seismic forces and secondary effects such as liquefaction in accordance with the current building code would be required. Implementation of site preparation measures as determined in a final design-level geotechnical report would reduce any identified potential liquefaction impacts to less-than-significant.

Unstable or Unsuitable Soils. Development on unstable or unsuitable soils could result in the failure of some structures or parts of structures. Existing soils that cannot support proposed improvements, cannot be reused as structural fill or landscape material, or could cause corrosion of subsurface improvements and be a source of damage to the new facilities over the operational life of the project would need to be either replaced with engineered fill or treated to meet geotechnical requirements. The final geotechnical investigation would identify underlying materials and their engineering characteristics. Soils identified as unsuitable for use as structural fill, such as improperly compacted artificial fill, expansive soils, or compressible soils, would require off-site disposal. The site is underlain by artificial fill that would likely be removed during excavation activities. Therefore, implementation of the recommendations of the final design-level geotechnical report consistent with current building code requirements would reduce potential impacts over the operational life of the project related to unstable soils to less-than-significant levels.

Groundwater. The proposed redevelopment would lower the depth of improvements, which could potentially bring the foundation floor below the existing groundwater table. Groundwater conditions at the site are currently influenced by the existing drainage system at the site, which collects water at a sump and pumps it to a storm drain (Hart Crowser, 2018). Dewatering would likely be required for the improvements; therefore, changes to groundwater patterns could occur, potentially causing any off-site contaminants, if present, to migrate onto the project site. The proposed design, however, would not require any permanent lowering of the groundwater table. The proposed foundation would be designed with improvements to the drainage system or implementation of a waterproofing system to withstand the hydrostatic forces that could be encountered at the site. Therefore, there would be no impact to groundwater levels related to the operations of this alternative.

Alternative 2: Modified Proposal

There would be no change in the potential impact severity of Alternative 2 when compared to Alternative 1. Alternative 2 would encounter the same existing geotechnical hazards, and with adherence to current building code requirements would have less-than-significant impacts on earth resources.

5.5 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

5.5.1 Construction

Construction mitigation measures are the same for both Alternative 1 and Alternative 2 and include the following to address geotechnical and erosional hazards at the site.

- Confirm that a Washington-licensed geotechnical engineer will conduct geotechnical hazard evaluations for proposed elements addressing groundshaking, fault rupture, liquefaction, and

landslides, and that geotechnical recommendations have been incorporated into the project design.

- Construction activities will be conducted in accordance with BMPs contained within the required SWPPP, consistent with the NPDES General Construction Permit.
- Proposed project components will be designed in accordance with the design recommendations presented in a final design-level project geotechnical report. This will ensure that facilities are designed to State Building Code standards, which are based on International Building Code seismic standards.
- Final design will include drainage control features to manage stormwater runoff and minimize erosion potential.
- Excavation activities will be conducted consistent with WAC requirements and include required shoring and safety systems.
- Earthwork activities will be monitored by a Washington-licensed geotechnical engineer to ensure that conditions encountered are consistent with the findings of the final design-level geotechnical report.
- Vibration monitoring will be conducted for the Northwest Rooms and International Plaza, Bressi Garage, and any other sensitive structures within about 100 feet of earthwork activities.
- Any dewatering necessary would be conducted in accordance with permit requirements.
- The contractor will work with the OVG Community Liaison during the construction period to help address concerns raised by the public or agencies in accordance with the MOU between OVG and the City.

5.5.2 Operations

Operations mitigation measures are the same for both Alternative 1 and Alternative 2 and include the following to address geotechnical and erosional hazards.

- Implementation of required storm drainage features would reduce the potential for erosion. City drainage control requirements would also be required and included as part of the final design plans.
- Develop a monitoring and maintenance program that includes inspection and reporting on structural stability. Monitor all improvements for changes in conditions such as cracking foundations or observed settlement that could reduce the ability of structures to resist seismic disturbances.
- If changes are identified during future inspection and monitoring of conditions, implement additional measures as directed by a Washington-licensed geotechnical engineer to reduce or minimize those impacts.
- The OVG Community Liaison will help address concerns raised by the public or agencies in accordance with the MOU between OVG and the City.

5.6 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON GEOLOGY AND SOILS

There would be no significant and unavoidable adverse impacts to geology and soils from either action alternative.

6.0 HISTORIC AND CULTURAL RESOURCES

This chapter provides a project-level analysis of potential impacts to known and probable historic and cultural resources in the study area. Historic and cultural resources can exist belowground and aboveground and can be archaeological sites, traditional cultural properties, buildings, structures, objects, or districts.

To be considered a historic resource, the resource generally must meet minimum age requirements. However, historic resources are not defined solely by their age but also by criteria related to their historic or cultural importance; this is known as "significance." Significant historic resources represent important themes, cultures, or patterns in our past. The significance of a resource may be at the national, state, or local level. For this analysis, the criteria used to evaluate the significance of a historic resource are established by the City's Landmarks Preservation Ordinance (SMC Chapter 25.12).

The evaluation status of a historic resource can vary. A historic resource can be listed in a historic register, recommended eligible for listing, or determined eligible for listing. Resources that have been evaluated and were determined to be not eligible for listing do not require consideration.

Belowground cultural resources can also be listed in historic registers. Under Washington State law, a historic archaeological resource must be eligible for listing in the National Register of Historic Places (NRHP) before it is considered "protected," but all precontact cultural resources are protected regardless of eligibility determinations. Historic archaeological resources that are determined to be eligible for listing in the NRHP and precontact cultural resources are collectively referred to hereafter as "protected archaeological resources" (PARs).

Key Findings for Historic and Cultural Resources

There are 4 designated Seattle Landmarks in the aboveground historic resources study area: KeyArena, Bressi Garage, the Northwest Rooms and International Fountain Pavilion, and the International Plaza. Significant impacts to all 4 Landmarks are expected under both Alternatives 1 and 2.

The character-defining elements of these Landmarks could be preserved through the Seattle Historic Preservation Program's Certificate of Approval process. This process is intended to preserve and maintain designated features of landmarks according to the Secretary of the Interior's Standards.

There are no recorded belowground cultural resources, traditional cultural properties, or districts on the project site. Precontact-era resources are unlikely to be present due to the previous development of the site. However, the area may contain historic-era resources associated with the early residential and commercial uses, especially at Thomas St and Bressi Garage. If resources are identified during construction, compliance with state law could result in a less-than-significant impact.

6.1 METHODS

The EIS Consultant Team reviewed historic registers, historical maps, photographs, and other documents to analyze past use of the aboveground historic resources study area and belowground cultural resources study area. In addition, all recorded belowground cultural resources within the study area were reviewed to determine the sensitivity for additional, unrecorded belowground cultural resources.

Because construction could begin as soon as October 2018, this analysis primarily addresses aboveground buildings, structures, and objects that were built in or before 1968 (50 years old or older at the time of construction). However, for consideration as a potential Seattle Landmark, a property must be at least 25 years old or older; for this project, that would apply to resources constructed in or before 1993. Information on the age of resources in the aboveground historic resources study area was compiled from the King County Department of Assessments and records provided by the Seattle Center.

The study area for aboveground historic resources is defined as the project site, Northwest Rooms and International Fountain Pavilion (referred to hereafter as "Northwest Rooms"), and the International Plaza. There are 12 aboveground historic resources adjacent to the aboveground historic resources study area; BOLA Architecture and Planning conducted a reconnaissance-level inventory of these resources in March 2018 for OVG (BOLA Architecture and Planning, 2018). The study area for belowground cultural resources is a 0.5-mile radius from the project site.

Data Sources: The analysis relied on records provided by the Seattle Center; King County Department of Assessments (2018); Washington Information System for Architectural and Archaeological Records Data (WISAARD) (DAHP, 2017); the Statewide Archaeological Predictive Model (DAHP, 2010; Kauhi, 2013); national, state, and local historic registers; existing cultural resources assessments; geological and historical maps (United States Surveyor General, 1859; USGS, 1895, 1897); geotechnical logs (Hart Crowser, 2017, 2018); local histories; and published ethnographic resources.

Key Terms – Cultural and Historic Resources

Precontact Cultural Resource: A resource that predates the point of contact between Native and non-Native peoples (including explorers, fur traders, and military personnel). In King County, the precontact era ended in 1792 with the arrival of explorer Captain George Vancouver. Non-Native settlement of the Seattle area began with the Denny Party in 1851.

Protected Archaeological Resource (PAR): A term developed for this analysis to encompass the types of resources protected under state law: a historic archaeological site eligible for listing in the NRHP and any precontact archaeological site, regardless of NRHP eligibility status.

Register-Listed: A resource that is listed on a national, state, or local historic register or is a designated Seattle Landmark.

Traditional Cultural Property: A property that is eligible for listing in the NRHP based on its associations with the traditional cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community.

Impact Analysis

Potential impacts to historic and cultural resources can be direct or indirect. Examples of direct and indirect impacts that could occur during the project are:

- ***Aboveground Historic Resources:*** Direct impacts could occur from demolition, vibration, or physical alterations that minimize a resource's integrity of design, materials, or workmanship. Indirect impacts to a resource's integrity of location, setting, feeling, or association are not anticipated.
- ***Belowground Cultural Resources:*** All impacts would be direct. These could occur from ground disturbance or modifications to the ground surface. No indirect impacts would occur.

6.2 REGULATORY CONTEXT

This project is subject to historic and cultural resources review under SEPA regulations, the Seattle Landmarks Preservation Ordinance (SMC 25.12), and Washington State archaeological resources laws. The City has adopted substantive SEPA policies to address historic and cultural resources issues (SMC Chapter 25.05.675(H)). Cultural resources are defined as historic buildings, special historic districts, and sites of archaeological significance.

Historic properties in Seattle may be recognized at the local level for their historical significance through the Seattle Landmarks Preservation Ordinance (SMC 25.12). The ordinance defines historic and cultural resources as objects, sites, or improvements (buildings, structures, or objects) that are at least 25 years old and have "interest or value as part of the development, heritage or cultural characteristics of the City, state, or nation, if it has integrity or the ability to convey its significance" and that meet at least one of 6 categories of significance (SMC 25.12.350). Changes to designated Seattle Landmarks are managed through a Certificate of Approval process with the Seattle Historic Preservation Program within the City's Department of Neighborhoods. This process is intended to manage change and find a reasonable approach that will be consistent with the Secretary of the Interior's Standards (Landmarks Preservation Board, 1987).

Four Washington State cultural resources protection laws would apply to this project during construction. These laws apply to all projects in Washington State, including those subject to SEPA: Archaeological Sites and Resources (RCW 27.53), Indian Graves and Records (RCW 27.44), Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60), and Human Remains (RCW 68.50). If a project requires work within the boundaries of a PAR, an excavation permit is required from the Washington State Department of Archaeology and Historic Preservation (DAHP). Information regarding archaeological site locations is exempt from public distribution and disclosure under Washington State law (RCW 42.56.300).

OVG is applying for federal historic rehabilitation tax credits from the Federal Historic Preservation Tax Incentives Program. However, this project does not constitute a federal undertaking that would require compliance with the National Historic Preservation Act. The project is not subject to compliance with federal cultural resources regulations because no federal funds, federal permits, or federal lands are involved.

On March 8, 2018, the Washington State Advisory Council on Historic Preservation formally listed KeyArena on the Washington Heritage Register and recommended it eligible for listing in the NRHP. This recommendation will be forwarded to the National Park Service, which administers the NRHP, for final approval and formal listing in the NRHP.

6.3 AFFECTED ENVIRONMENT

This analysis uses 2 study areas: one for belowground cultural resources and one for aboveground historic resources (Figure 6-1). The study area for belowground cultural resources is a 0.5-mile radius from the project site. This study area provides context for an analysis of potential impacts within the project site by incorporating information about previous archaeological investigations and recorded archaeological sites with project-specific geotechnical information. The study area for aboveground historic resources includes the project site, the Northwest Rooms, and the International Plaza.

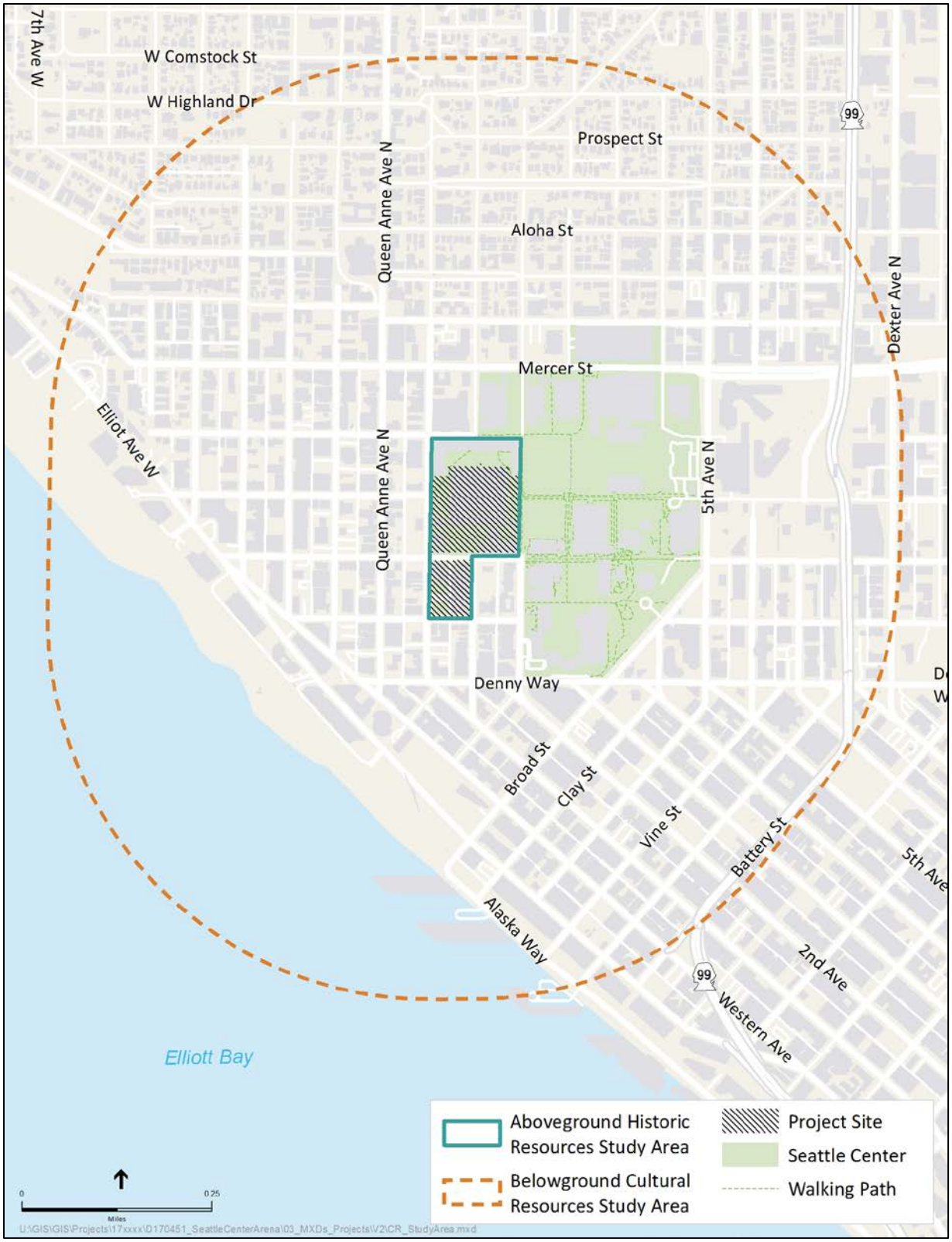


Figure 6-1. Historic and Cultural Resources Study Areas

6.3.1 Geology and Soils

Geotechnical logs indicate that the project site is broadly covered by placed fill ranging from approximately 10 to 30 feet in thickness (Hart Crowser, 2018). The lack of substantial natural deposition during the Holocene epoch, coupled with extensive site preparation to construct KeyArena, suggests that the project site has a low likelihood to contain buried, intact archaeological sites. For more detail, see Appendix D.

6.3.2 Precontact and Ethnographic Eras

Archaeological and historical records document Native American use of the belowground cultural resources study area, suggesting a potential for ephemeral belowground archaeological resources in the study area. A Native American trail known as *scHákWsHud* ("trail to the beach") trail passed immediately north of the project site, roughly following the alignment of today's Republican Street (United States Surveyor General, 1859). The trail led from Lake Union to Elliott Bay. The Duwamish village of *babáqWab / báqWbaqWab* or "Little Prairie / Large Prairie" was located along the trail, in the vicinity of Belltown (Hilbert et al., 2001; Thrush, 2007; Waterman, 1922). The village consisted of at least 2 longhouses measuring 48 by 96 feet (Thrush, 2007). Historical accounts of the village's exact location vary, but it appears to have been within 0.5 mile of the project site (Bass, 1937; Lewarch et al., 2004). For more detail, see Appendix D.

6.3.3 Historic Era

This section provides a brief history of development of the aboveground historic resources study area and belowground cultural resources study area in order to provide context for analysis of the potential that belowground cultural resources are present within the project site, as well as to provide context for the existing buildings in the aboveground historic resources study area. Non-Native development of the belowground cultural resources study area began in the early 1890s (USGS, 1895, 1897). The earliest detailed maps of the project site date to 1893 and show it as sparsely residential with a few stores and a Seventh-Day Adventist Church. Density increased through the late 1890s, and by 1905 the project site featured single-family and multi-family residences, a drug and meat store, and a cigar factory. The area became known as the Warren Avenue neighborhood. The neighborhood was dominated by the large 1903 Warren Avenue Public School on Block 35, which is now the northeast quadrant of the KeyArena site. The school served as a neighborhood anchor until its demolition in 1959. By 1917, more stores were located in the project site on Block 30, along 1st Ave N (blocks are shown in Figure 6-2). The mostly working class neighborhood continued to sustain a mix of residential and commercial uses through the 1950s (Artifacts Architectural Consulting, 2013).

When Seattle voters approved construction of a Civic Center in 1957 to host the 1962 World's Fair, the Warren Avenue neighborhood changed drastically. The World's Fair, also known as the Century 21 Exposition (Exposition), changed the once residential and small-scale commercial setting into a planned complex of futuristic buildings, structures, and objects (Becker et al., 2011). Residents moved away from the neighborhood and within a few years nearly all existing resources were demolished to make way for the complex. Several buildings on the project site remained: Bressi Garage, Blue Spruce Apartments, and the West Court Building (known then as the Western Pacific Insurance Company offices). These buildings were repurposed for the Century 21 Exposition, with the exception of Bressi Garage, which continued to operate in its original capacity until the City purchased the property in 1966 (Pratt, 2017).

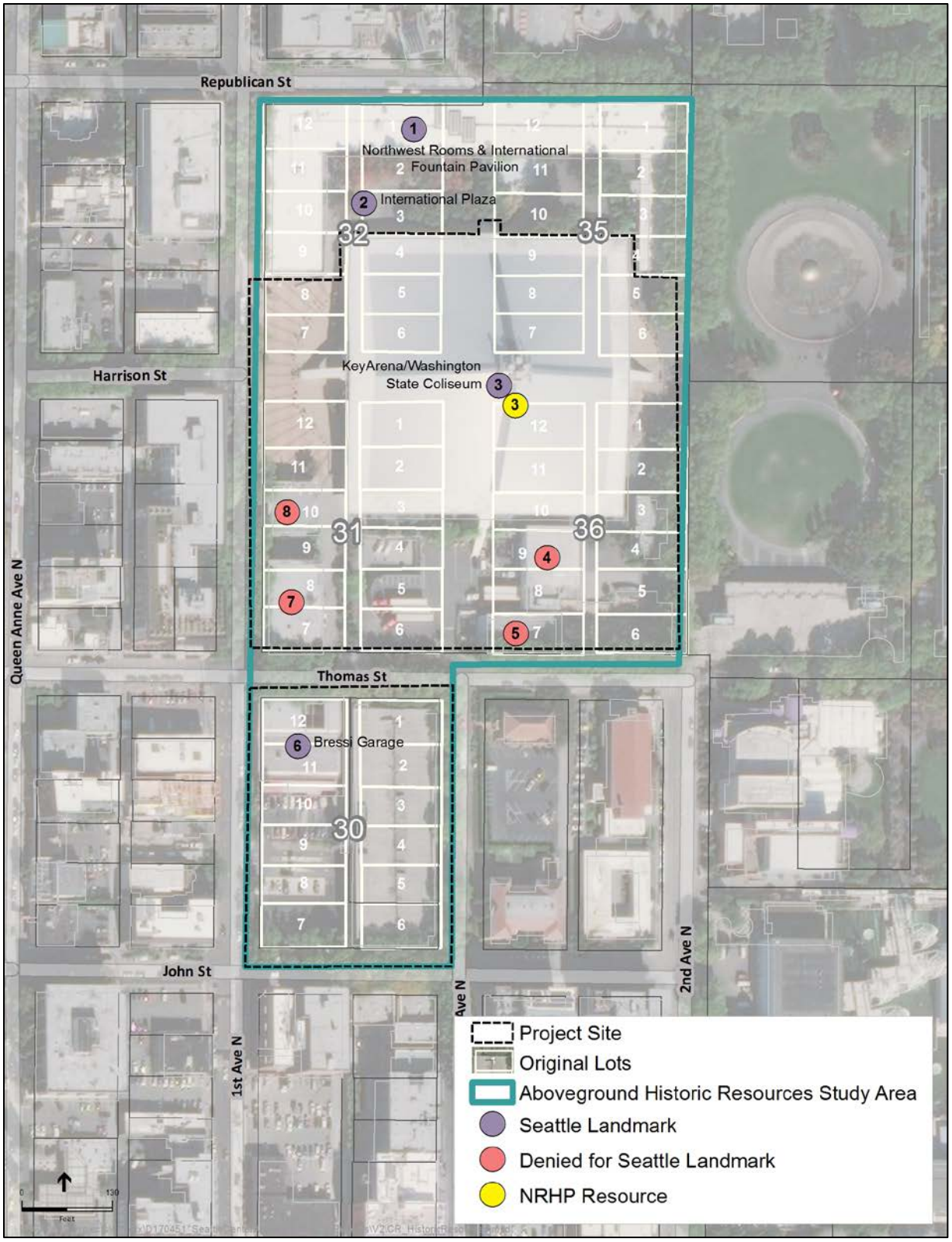


Figure 6-2. Aboveground Historic Resources in the Study Area

After the Exposition ended, the grounds became a City-owned cultural and recreational facility. Some of the buildings and structures erected for the Exposition have been renovated or demolished, and new buildings have been added over time. Commercial growth within Uptown during the late 1960s and early 1970s was met with resistance from residents who sought to retain neighborhood views and character (Lentz and Sheridan, 2005). More waves of construction took place in the 1990s and included the renovation of KeyArena in 1994–1995 and construction of the 1st Ave N Garage in 1998. Within the last decade, several large mixed-use buildings were erected in the neighborhood, including the block-long Astro Apartment building in 2014 along 1st Ave N between Thomas St and Harrison St.

6.3.4 Aboveground Historic Resources

The aboveground historic resources study area contains 4 designated Seattle Landmarks: the KeyArena/Washington State Coliseum (referred to in this EIS analysis as "KeyArena" for clarity), Bressi Garage, the building complex known as the Northwest Rooms and International Fountain Pavilion (referred to in this EIS analysis as the "Northwest Rooms"), and the International Plaza. The International Plaza is the open space associated with the Northwest Rooms. The Northwest Rooms and International Plaza were designated as Seattle Landmarks together (Table 6-1, Figure 6-2).

Four other buildings in the aboveground historic resources study area were reviewed by the Landmarks Preservation Board in 2017 and were denied designation as Seattle Landmarks: the West Court Building/Western Pacific Insurance Company (built in 1953), NASA Building/Century 21 NASA Pavilion (built in 1962), Blue Spruce Apartments/Century 21 Administration Building (built in 1956), and the Seattle Center Pavilion (built in 1962, renovated in 1995) (Landmarks Preservation Board Meeting Minutes, August 2, 2017). No further analysis of these 4 resources is warranted for this Draft EIS.

Table 6-1. Designated Landmarks in the Aboveground Historic Resources Study Area

Map No. [1]	Landmark Name	Year Built	Designated Features	Controls and Incentives Agreement Status
1, 2	Northwest Rooms and International Fountain Pavilion and associated International Plaza	1962	"a portion of the site (delineated in Attachment A [see Appendix] and the exteriors of the building"[2]	Finalized 2014
3	KeyArena/Washington State Coliseum	1962	"the site and exterior"[3]	In Negotiations
6	Bressi Garage	1923	"the exteriors of the two former garage buildings, and the interior roof trusses and decking"[3]	In Negotiations

[1]See Figure 6-2.
[2] Controls and Incentives Agreement, April 2014 (Nellams and Gordon, 2014).
[3] Landmarks Preservation Board Meeting Minutes, August 2, 2017.

Proposed changes to designated Landmarks would be subject to Controls and Incentives Agreements. These agreements state what alterations would require a Certificate of Approval from the Landmarks Preservation Board and include specific lists of exceptions (e.g., in-kind maintenance or repairs of the site and exterior).

At the time of Draft EIS publication, the Controls and Incentives Agreements for KeyArena and Bressi Garage have not been finalized. The analysis in the Draft EIS is based on the most current drafts available, dated October 11, 2017 (Nellams and Sodt, 2017a, 2017b), and updated February 20, 2018. The Controls and Incentives Agreements are expected to be finalized after the publication of the Draft EIS, but before the Final EIS. The Controls and Incentives Agreement for the Northwest Rooms and associated International Plaza was signed in 2014. This agreement is included in Appendix D.

In March 2018, BOLA Architecture and Planning conducted a reconnaissance-level historic property inventory for OVG of historic resources adjacent to the project site (BOLA Architecture and Planning, 2018). The inventory identified 12 historic resources. BOLA evaluated these resources for their potential eligibility for designation as Seattle Landmarks and listing in the NRHP.

The inventory identified 7 historic resources that are potentially eligible for designation as a Seattle Landmark and for listing in the NRHP; 2 of these are already designated Landmarks (the Northwest Rooms and the International Plaza) and 2 were previously determined eligible by DAHP for listing in the NRHP during separate inventory projects (the Pittsburgh Apartments and the Delmasso Apartments). Based on an analysis of the proposed work under Alternative 1 and Alternative 2, no impacts to these historic resources are anticipated.

6.3.5 Belowground Cultural Resources

No belowground cultural resources are recorded within or immediately adjacent to the project site (DAHP, 2017). No previous subsurface archaeological investigations have been conducted on the project site. To assess the affected environment for belowground cultural resources and the potential for previously unidentified belowground cultural resources at the project site, the belowground cultural resources study area was reviewed to provide context.

Numerous previous cultural resources assessments have been completed within the belowground cultural resources study area (for the list, see the bibliography in Appendix D). These were conducted between 1997 and 2015 and included both subsurface surveys and non-fieldwork management documents. They were prepared for unrelated projects.

There are 3 previously recorded historic archaeological sites between 0.12 mile and 0.5 mile of the project site. One of the sites also included a potential precontact component. Two of the sites relate to City infrastructure, and the third is the location of ruins of former residential and commercial properties. None of the sites has been determined eligible for listing in the NRHP.

Precontact Cultural Resources Potential

DAHP maintains a predictive tool – the Statewide Archaeological Predictive Model – used by archaeologists and planners to evaluate the risk for precontact archaeological sites (DAHP, 2010). The model was developed to statistically evaluate multiple environmental factors (e.g., elevation, slope percent, aspect, distance to water, soils, and landforms) to predict where precontact archaeological resources might be found on a broad scale (Kauhi, 2013). An important limitation of the model is that it generally does not incorporate data regarding historical and recent land use.

Although the Statewide Archaeological Predictive Model classifies the project site as Very High to High Risk for containing precontact archaeological sites (the 2 highest possible classifications), due to the extensive historical and recent development of the project site, it is highly unlikely that precontact archaeological sites, if ever present on the project site, remain intact. Urbanization and development

frequently destroy precontact archaeological sites, particularly those on landforms with little to no natural deposits, such as the project site.

Historic-Era Cultural Resources

The Statewide Archaeological Predictive Model does not assess risk for encountering historic-era archaeological resources. The potential for the presence of historic-era archaeological resources is based on the review of known past development. The project site has contained buildings, structures, and objects since at least 1893; therefore, it is possible that archaeological remains from the historic-era exist within the project site. However, it is highly likely that the development of KeyArena, including widespread grading and deep excavation into glacial-aged deposits, severely disturbed or completely removed any earlier historic-era archaeological remains that may have been present within this portion of the project site. It is highly likely that construction of the 1st Ave N Garage severely disturbed or completely removed any earlier historic-era archaeological remains that may have been present in this location. However, the sediments below Bressi Garage and the existing surface parking lot to the south of Bressi Garage may be less disturbed because minimal excavation would have been needed for construction of these facilities.

6.4 POTENTIAL IMPACTS

Impacts can be related to construction activities or to the operation of the project.

6.4.1 Construction Impacts

Potentially significant construction impacts to historic and cultural resources are defined as follows. Impacts not reaching the threshold would be less-than-significant.

Criteria for Significant Construction Impacts to Aboveground Historic Resources: The impacts to aboveground historic resources would be significant if construction were to demolish or permanently alter a landmark's designated features.

Criteria for Significant Construction Impacts to Belowground Cultural Resources (Protected Archaeological Resources): The impacts to belowground cultural resources would be significant if construction were to modify the depositional integrity (i.e., distribution of artifacts in relation to each other) of the resources.

No Action Alternative

No construction impacts to historic and cultural resources are anticipated, as KeyArena would not be renovated; the buildings on site would remain (with the exception of possible renovations associated with planned maintenance); no new buildings would be constructed except as directed by existing and proposed Seattle Center planning efforts; and there would be no change to Bressi Garage, the Northwest Rooms, or International Plaza. Future modifications to KeyArena, the Northwest Rooms, International Plaza, and Bressi Garage would be managed through the Seattle Historic Preservation Program's Certificate of Approval process.

Alternative 1: OVG Proposal

Aboveground Historic Resources

KeyArena

Potential construction impacts to KeyArena's Landmark-designated features under Alternative 1 include changes to the existing building exterior and site. Changes to the interior would also occur from redesign and reconstruction, but KeyArena's interiors are not Landmark-designated features. Alternative 1 would preserve and restore KeyArena's roof and edge beam structure, pylons, and the north, west, and east curtain walls. The south façade, including the curtain wall, would be removed and not replaced. Roof panels, which were last replaced during the 1994/1995 renovation, may require replacement. On the south of the building, a primarily glass atrium lobby would be built and would enclose the south pylon and V-shaped support columns. The atrium lobby would not be wider than the existing façade and roofline or taller than the existing roofline. Digital signage would be placed on the exterior of the atrium lobby, and some displays would be visible through the glass. The design includes accent lighting strips on the roof.

Additional exhaust fans would make the cupola on the roof more than 50% larger, but not taller, than the existing cupola. A larger and brighter sign than currently exists would be placed on top. A bigger and brighter digital reader board would be installed on 1st Ave N, replacing the existing digital sign. In addition to the roof, accent lighting would be added to the building and throughout the site (See Chapter 9, *Visual Resources,* for more information about signs and lighting).

Potential construction impacts to the exterior of KeyArena could also result from vibration from construction. Alterations to the KeyArena site would occur through the demolition of adjacent buildings (Table 6-2), one surface parking lot and loading/marshalling area to the south of KeyArena, and open-space pedestrian plazas to the west and east of KeyArena that would be replaced with new open-space pedestrian plazas that approximate the grade and elevations of the original 1962 design. A belowground parking garage would be constructed below the south plaza with vehicle access from Thomas St.

The proposed atrium lobby, new sign on top of KeyArena, and demolition of existing surrounding buildings and open-space pedestrian plazas would permanently alter KeyArena's exterior and site, resulting in significant impacts to its Landmark-designated features. However, according to the KeyArena draft Controls and Incentives Agreement, some of these changes (such as changes to signage) may not diminish the building's character-defining elements. Whether or not these changes require review and approval from the Seattle Historic Preservation Program through the Certificate of Approval process will be determined when the Controls and Incentives Agreement for KeyArena is finalized; this would occur after publication of the Draft EIS but before publication of the Final EIS. Refer to Appendix D for a more detailed description of the Certificate of Approval process.

Table 6-2. Buildings and Structures Proposed for Alterations Under Alternative 1

Map No. [1]	Building / Structure	Potential Direct Impact	Seattle Landmark Status	Potential Impact Magnitude
1, 2	Northwest Rooms and International Fountain Pavilion and associated International Plaza	Vibration and Alterations to Building and Site	Designated	Significant
3	KeyArena/Washington State Coliseum	Vibration and Alterations to Building and Site	Designated	Significant
4	Seattle Center Pavilion	Demolition	Denied	N/A – not historic
5	Blue Spruce Apartments	Demolition	Denied	N/A – not historic
6	Bressi Garage	Vibration and Alterations to Building and Site	Designated	Significant
6	Kiln Shed at Bressi Garage	Demolition	Denied	N/A – not historic
7	NASA Building	Demolition	Denied	N/A – not historic
8	West Court Building	Demolition	Denied	N/A – not historic
--	Skatepark	Demolition	N/A – less than 25 years old	N/A – not historic
--	Restroom Pavilion	Demolition	N/A – less than 25 years old	N/A – not historic

[1] See Figure 6-2.

Northwest Rooms and International Plaza

Alternative 1 would significantly impact the Landmark-designated features of the Northwest Rooms and International Plaza (the exterior and a portion of the site). Impacts would occur from excavation immediately adjacent to the east and west ends of the Northwest Rooms, possible changes to or partially blocking the southeast and southwest designated façades, modifying the breezeway roof of the Northwest Rooms to accommodate construction equipment access, and permanent installation of an overlook and ADA ramp in the International Plaza. Impacts could occur from vibration during excavation and shoring, removal and replacement of existing hardscape, removal of 2 legacy trees, and removal of artwork (which would be stored and reinstalled). In addition, Alternative 1 may impact the existing tunnel beneath the International Plaza, which would either be repaired or filled and capped.

Bressi Garage

Proposed tunneling under Bressi Garage for Alternative 1 would impact the Landmark-designated features of Bressi Garage (the exterior and interior trusses and roof decking). The tunnel could be constructed using a tunnel boring machine, auger, or open cut. For this analysis, the open cut construction method was evaluated as it has the greatest potential to impact Bressi Garage. If the tunnel is constructed as open cut, OVG would disassemble the building, catalog and store the building components, then reassemble the building after construction is complete. This would be temporary but would be a significant impact to the Landmark-designated features during the construction period. Total disassembly of a building is the least desirable method of moving historic buildings, as it introduces the

risk of loss during disassembly. For masonry buildings like Bressi Garage, breakage of masonry units (bricks) could occur. Replacement units of the same texture and coloration of the original units can be difficult to reproduce, and the original fabric of the building would be lost (Curtis, 1979). If the tunnel is constructed using a tunnel boring machine or augering under Bressi Garage, there could be impacts to the exterior of Bressi Garage from vibration. The building may need to be stabilized during excavation. This would be a significant impact.

Summary

In summary, construction of Alternative 1 would significantly impact designated landmarks. Proposed work would impact the exterior and site of KeyArena, the exterior and site of the Northwest Rooms and International Plaza, and the exterior and interior of Bressi Garage (if an open cut tunnel construction method is used). Building stabilization may be required to perform this work to protect the Landmark-designated features of these buildings. The construction would be undertaken to be consistent with requirements of the Seattle Historic Preservation Program's Certificate of Approval process, which is intended to preserve and maintain designated features of landmarks.

Belowground Cultural Resources

Alternative 1 has the potential to impact the depositional integrity of precontact-era and historic-era belowground cultural resources, if present within the project site. All potential construction impacts to belowground cultural resources would be direct and permanent. Construction impacts could occur from excavation, compaction, or vibration. No subsurface testing has been conducted within the project site to date, and no belowground cultural resources are known to exist. The majority of the project site has been highly disturbed during multiple construction projects.

While recorded archaeological sites and documented trails and villages are in close proximity to the project site, historic development of the area (including widespread grading and deep excavation into glacial-aged deposits for the original construction of KeyArena) has likely severely disturbed or completely removed any precontact archaeological remains that may once have been present. Any precontact archaeological sites remaining within the project site would meet the definition of a PAR, resulting in impacts under Alternative 1; however, such resources, if present, would likely consist of sparse artifact scatters that would not require intensive investigation to mitigate.

The project site, in particular the Bressi Garage area, has the potential to contain resources related to the early development of the Warren Avenue neighborhood, which could be represented by the archaeological remains of building foundations, domestic and commercial refuse, or privies. The proposed access to a new underground parking garage off Thomas St and a tunnel under Bressi Garage parallel to 1st Ave N would pass through the former locations of single-family residences and associated automobile garages present from 1905–1917 until c.1957. If present, the nature, extent, and age of these historic archaeological resources would determine whether they meet the definition of a PAR, and thus result in impacts under Alternative 1. Based on the types of archaeological remains that could be present (partial building foundations, domestic and commercial refuse, or privies), it is probable that these would not meet the criteria for consideration as a PAR based on DAHP's evaluation of similar types of resources.

The KeyArena portion of the project site could contain remains related to the Warren Avenue Public School, Seventh Day Adventist Church, or the many former residences and stores within the project site. The potential that intact cultural resources exist in these portions of the project site is unlikely due to the amount of disturbance during construction of KeyArena, the Northwest Rooms, and the

International Plaza. Although unlikely, if belowground resources are encountered, the impact would be significant. For potential mitigation measures relating to belowground cultural resources, see Section 6.5.2.

Temporary construction easements may extend outside of the project site for tieback of construction walls and/or placement of crane(s) for garage construction. To the north and east of KeyArena, construction easements would extend outside of the project site into the Seattle Center campus. To the west and south of KeyArena, the construction easements may extend into the immediately adjacent streets. For tunnel and utility work, construction easements would extend into adjacent streets, particularly Thomas St. Such work would require excavation, including for utility work within existing road right-of-way. Excavation could impact the depositional integrity of belowground cultural resources, if present.

In summary, Alternative 1 has the potential to impact the depositional integrity of belowground cultural resources, if present. As noted above, it is unlikely that belowground cultural resources are present in the KeyArena, Northwest Rooms, and International Plaza portion of the belowground cultural resources study area, which has already been highly disturbed. However, the Bressi Garage portion could contain the remains of former building foundations, domestic and commercial refuse, or privies. For potential mitigation measures relating to potential belowground cultural resources, see Section 6.5.2.

Alternative 2: Modified Proposal

Aboveground Historic Resources

KeyArena

Potential construction impacts to KeyArena and buildings on the KeyArena site would be the same as those under Alternative 1, with the exception of the sign on the top of the arena and the digital sign on 1st Ave N, which would be the same size and brightness as the existing signs. Alternative 2 would have signs similar to existing conditions.

Northwest Rooms and International Plaza

Potential construction impacts to the Northwest Rooms and International Plaza would be the same as those under Alternative 1.

Bressi Garage

Potential construction impacts to Bressi Garage under Alternative 2 would be different from Alternative 1. Alternative 2 proposes a tunnel east of Bressi Garage rather than under it. As a masonry building, there could be impacts to the exterior of Bressi Garage from vibration during tunnel construction along the east side of the building. The building may need to be stabilized during excavation. Alternative 2 would not require the disassembly, storage and cataloging of building components, and reassembly of the building, and the vibration from tunnel construction would likely be less than under Alternative 1, as the tunnel would not pass beneath the building. However, if there are impacts to the exterior of the building, these impacts would be significant.

Summary

In summary, Alternative 2 would result in significant impacts to aboveground historic resources. Proposed work would impact the exterior and site of KeyArena, the exteriors of the Northwest Rooms and International Plaza, and could impact the exterior of the Bressi Garage. However, impacts to Bressi

Garage could be less than under Alternative 1 as the tunnel would not pass beneath the building. Changes to Landmark-designated features would be undertaken in a way that is consistent with requirements of the Seattle Historic Preservation Program's Certificate of Approval process, which is intended to preserve and maintain designated features of landmarks.

Belowground Cultural Resources

Potential construction impacts to belowground cultural resources at the Thomas St underground parking garage entrance would be the same as Alternative 1. The potential construction impacts from the new loading dock access tunnel off 1st Ave N would be similar to Alternative 1 but have the potential to affect different belowground cultural resources. The tunnel would pass through the locations of single-family residences built in 1904 and 1905 and their associated detached automobile garages, multi-family dwellings, and the Victor Garage built in 1917. All structures and houses were extant until c.1957. Additionally, potential impacts to belowground cultural resources from temporary construction easements would be the same as Alternative 1.

In summary, Alternative 2 has the potential to impact the depositional integrity of belowground cultural resources, if present. As noted above, it is unlikely that belowground cultural resources are present in the KeyArena portion of the belowground cultural resources study area, which has already been highly disturbed. However, the Bressi Garage portion could contain the remains of former building foundations, domestic and commercial refuse, or privies. For potential mitigation measures relating to potential belowground cultural resources, see Section 6.5.2.

6.4.2 Operations Impacts

Potentially significant operations impacts to historic and cultural resources are defined below. Impacts not reaching the threshold would be less-than-significant.

Criteria for Significant Operations Impacts to Aboveground Historic Resources: The impacts of operations activities would be significant if they were to result in ongoing modifications to historic resources that derive their historic significance from their integrity of setting, feeling, or association and which cannot be mitigated.

Criteria for Significant Operations Impacts to Belowground Cultural Resources: Operations impacts to belowground cultural resources would not occur. Any impact would occur during construction, as described in Section 6.4.1.

No Action Alternative

No operations impacts to historic and cultural resources are anticipated, as impacts to historic and cultural resources occur during construction, not operation, and no construction is proposed. Additionally, no operational changes are proposed.

Alternative 1: OVG Proposal

Aboveground Historic Resources

No operations impacts to aboveground historic resources are anticipated, as impacts to KeyArena, the Northwest Rooms, International Plaza, and Bressi Garage would occur during construction, not during

operation. Additionally, the buildings and structures would retain their same functions after construction is complete.

Belowground Cultural Resources

There would be no operations impacts to belowground cultural resources. All potential impacts to belowground cultural resources would occur during construction, as described in Section 6.4.1.

Alternative 2: Modified Proposal

Aboveground Historic Resources

Potential operations impacts to aboveground historic resources are anticipated to be the same as those under Alternative 1.

Belowground Cultural Resources

There would be no operations impacts to belowground cultural resources. All potential impacts to belowground cultural resources would occur during construction, as described in Section 6.4.1.

6.5 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

6.5.1 Aboveground Historic Resources

It is City policy to maintain and preserve significant historic sites and structures; for projects involving designated landmarks, the City considers compliance with the Landmarks Preservation Ordinance as compliance with this policy (SMC 25.05.675(H)(2)), but does not consider this compliance to be a mitigation measure. Additionally, for projects that are adjacent to or across the street from a landmark, such as KeyArena's adjacency to the Northwest Rooms and International Plaza, the City may require mitigation to reduce impacts on the adjacent landmark. Subject to the City's Overview Policy (SMC 25.05.665), potential mitigating measures are limited to the following (SMC 25.05.675(H)(2)(d)):

- Sympathetic façade treatment.
- Sympathetic street treatment.
- Sympathetic design treatment.
- Reconfiguration of the project and/or relocation of the project on the project site.

Significant impacts to KeyArena, Bressi Garage, the Northwest Rooms, and the International Plaza under Alternative 1 and Alternative 2 could be managed through the Certificate of Approval process, which is a process to manage change in such a way that it will be consistent with the Secretary of the Interior's Standards. Consistency with this process will preserve character-defining elements of the designated features of these landmarks. A Controls and Incentives Agreement exists for the Northwest Rooms and International Plaza; agreements for KeyArena and Bressi Garage have not yet been finalized but are anticipated to be so before publication of the Final EIS. Additionally, impacts to the exteriors of KeyArena, the Northwest Rooms, International Plaza, and Bressi Garage could be minimized through

building stabilization. Impacts to the exterior masonry walls of Bressi Garage could be minimized through restoration (e.g., in-kind tuck-pointing and cleaning) as necessary. OVG would conduct vibration monitoring for the Northwest Rooms, International Plaza, Bressi Garage, and any other sensitive structures within approximately 100 feet of earthwork activities.

6.5.2 Belowground Cultural Resources

If an archaeological resource is identified during project construction, mitigation measures will be developed through consultation with the SEPA Lead Agency, DAHP, and affected Tribes. DAHP has certain regulatory authority over archaeological resources in Washington State. In accordance with state law (RCW 27.53), an archaeological resource identified during construction is protected until DAHP determines whether or not it is eligible for listing in the NRHP; isolated (single) artifacts, either precontact or historic-era, are not protected because they do not meet the definition of a "site" under state law [WAC 25-48-020(9)]. If human remains are discovered during construction, OVG will follow procedures dictated by state law (RCW 27.44).

It is City policy to maintain and preserve significant historic sites and structures and to provide the opportunity for analysis of archaeological sites; for projects with potential archaeological significance, the City may require an assessment of the archaeological potential of the site (SMC 25.05.675(H)(2)(e)). Subject to the City's Overview Policy (SMC 25.05.665), measures that may be required to mitigate adverse impacts to an archaeological site include but are not limited to the following (SMC 25.05.675(H)(2)(e)):

- Relocation of the project on the site.
- Providing markers, plaques, or recognition of discovery.
- Imposing a delay of as much as 90 days (or more than 90 days for extraordinary circumstances) to allow archaeological artifacts and information to be analyzed.
- Excavation and recovery of artifacts.

OVG has committed to preparing and implementing an Inadvertent Discovery Plan (IDP) for the project. An IDP establishes the procedures to follow if any subsurface historic or cultural resources are encountered during project construction. The IDP will follow state law and local ordinances specific to the protection of archaeological resources.

6.6 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON HISTORIC AND CULTURAL RESOURCES

Both Alternative 1 and Alternative 2 would result in significant and unavoidable adverse impacts to aboveground historic resources. Alternative 1 and Alternative 2 would impact the Landmark-designated features of KeyArena, Bressi Garage, the Northwest Rooms, and the International Plaza through alterations to their exteriors and sites. It is likely that potential impacts can be managed through compliance with the Seattle Historic Preservation Ordinance, which is intended to manage change and find a reasonable approach that is consistent with the Secretary of the Interior's Standards, but the City does not consider this process to be mitigation. No significant and unavoidable adverse impacts to belowground cultural resources are anticipated by the project.

7.0 RECREATION

This chapter provides a project-level analysis of potential impacts to recreation from the Seattle Center Arena Renovation Project. Recreation includes current uses of KeyArena and other recreational facilities at the project site; facilities, uses, and events at Seattle Center; and other recreational uses in Uptown. Because the project is located within Seattle Center (an arts, culture, sports, and entertainment campus), recreation evaluated in this section includes performance and entertainment events as well as public parks and open space. Impacts to recreation-related Seattle Center tenants (such as Pottery Northwest) are addressed in Chapter 3 (*Land Use*). This Recreation chapter describes impacts to users of recreational programming associated with those tenants.

Key Findings for Recreation

During the construction period, the Seattle Center Arena Renovation Project would temporarily displace recreational events (such as concerts and Seattle Storm basketball games) that currently take place at KeyArena. However, these events could be accommodated elsewhere in the greater Seattle area. The DuPen Fountain would be closed during the duration of the construction period. Construction activity on 2nd Ave N would impact the International Fountain and Lawn, and loss of curb space due to road closure would affect event load-in and load-out as well as school bus unloading.

Operational impacts would include the permanent removal of the Seattle Center Pavilion. However, other events spaces on the Seattle Center campus (such as Fisher Pavilion and the Exhibition Hall) could accommodate events currently held at the pavilion. The Seattle Center Skatepark would also be removed but would be replaced elsewhere.

A renovated arena would provide Seattle Center and the city with an updated sports and entertainment arena that could accommodate NHL and NBA teams, and would provide an upgraded recreational experience for existing uses such as concerts and Seattle Storm games.

7.1 METHODS

Recreational facilities, amenities, and uses were identified by gathering maps and programming information for recreational features in the recreation study area from online sources and from Seattle Center. Construction impacts were analyzed by identifying construction activities that could temporarily limit, disrupt, or displace recreational facilities, activities, or programming in the study area. Operations impacts were analyzed by identifying the recreational facilities proposed in the alternatives and by considering how existing programming would (or would not) be able to use those facilities.

7.2 REGULATORY CONTEXT

The proposed project is subject to SEPA regulations, the Seattle Municipal Code, and other local plans.

7.2.1 Seattle 2035 Comprehensive Plan

The Seattle 2035 Comprehensive Plan sets goals and policies for various planning elements, including Parks and Open Space, and for neighborhoods, including Queen Anne (Uptown). The Parks and Open Space element of the plan lists Seattle Center as a “unique urban amenity that offers both open space and a wide variety of cultural activities.” Goal P-G1 in the plan is to “[p]rovide a variety of outdoor and indoor spaces throughout the city for all people to play, learn, contemplate, and build community” (City of Seattle, 2016).

The Queen Anne (Uptown) element of the plan includes Goal QA-G5: "Queen Anne is a neighborhood that meets the parks and open space needs of its population by maintaining existing parks, identifying future needs, providing connections between parks and the community, and enhancing historic Queen Anne Boulevard."

The element also includes the following policies related to recreation:

- QA-P14: Encourage Seattle Center to plan and implement development that will enhance the quality of life in the Queen Anne neighborhood.
- QA-P15: Seek ways to ensure that Seattle Center remains a vibrant and valuable community resource and a premier regional amenity.
- QA-P19: Seek to maintain Queen Anne parks and open spaces and replace aging parks facilities used by the public, and seek to ensure no net loss of parks, park facilities, or open spaces while recognizing the need for a citywide balance in ongoing maintenance and investment.
- QA-P20: Accommodate a range of uses in parks to meet the needs and interests of the Queen Anne population.
- QA-P21: Strive to meet the open space and parks and recreation needs of the Queen Anne population, including the Urban Center.
- QA-P22: Strive to provide trails and non-motorized linkages throughout and around Queen Anne.
- QA-P23: Seek to provide abundant green spaces and streetscapes throughout Queen Anne.
- QA-P28: Ensure that public park lands are retained and maintained for public use.
- QA-P38: Strive to provide a system of bicycle facilities and routes within and around Queen Anne to encourage increasingly safe and convenient commuter and recreational bicycle use as an alternative to motorized travel (City of Seattle, 2016).

7.2.2 Seattle Parks and Recreation 2017 Parks and Open Space Plan

The Seattle Parks and Recreation 2017 Parks and Open Space Plan (Seattle Parks and Recreation [SPR], 2017a) sets goals and policies and analyzes gaps in the park system.

The goals in the plan are to:

1. Provide a variety of outdoor and indoor spaces throughout the city for all people to play, learn, contemplate, and build community.
2. Continue to provide opportunities for all people across Seattle to participate in a variety of recreational activities.
3. Manage the City's park and recreation facilities to provide safe and welcoming places.
4. Plan and maintain Seattle's parks and facilities to accommodate park users and visitors.
5. Engage with community members on Parks and Recreation plans, and design and develop parks and facilities, based on the specific needs and cultures of the communities that the park is intended to serve.

The Gaps in Walkability analysis in the Seattle Parks and Recreation Gap Analysis web portal associated with the Parks and Open Space Plan shows that there are no Parks and Recreation facilities in Uptown that are greater than 10,000 square feet in size (the cutoff chosen by Parks and Recreation for the walkability analysis). The majority of Uptown is mapped as having a gap in walkability to recreation facilities. Taking Seattle Center (which is not owned or operated by Parks and Recreation) into account as a recreational facility, the majority of Uptown is shown as within walking distance of a recreational facility; however, 4 areas still show gaps in walkability to recreation facilities (SPR, 2017b).

7.2.3 Seattle Center Century 21 Master Plan

The Seattle Center Century 21 Master Plan articulates a vision for the future of Seattle Center (Seattle Center, 2008). The Master Plan includes the following goals:

- Enhance Seattle Center's position as the Nation's Best Gathering Place.
- Dramatically increase open space.
- Connect Seattle Center's dynamic facilities into a synergistic whole.
- Provide capacity for existing and future arts, cultural and recreational programs, to be nurtured, grown and developed.
- Create program and design that captivates and attracts private funding partners.
- Build on the history of Seattle Center while creating the flexible framework to provide for the needs of the future.
- Integrate environmental sustainability in design, construction and operations to reduce energy demands and serve as a model for sustainable development.
- Enrich and connect to the fabric of adjacent neighborhoods through welcoming design, programming and operations.
- Increase accessibility to the center of the grounds for all users.
- Encourage greater mass transit use and easier non-motorized connections.
- Improve pedestrian safety.
- Provide the programs and destinations to attract a larger and increasingly diverse number of visitors (Seattle Center, 2008).

7.2.4 City of Seattle Citywide Skatepark Plan

SPR and the Skatepark Advisory Task Force developed the City of Seattle Citywide Skatepark Plan (2007) in response to a City Council resolution "recognizing skateboarding as a healthy and popular recreation" (SPR, 2007). The Skatepark Plan recommended development of skateparks at 26 sites in the city and established a system of types of skateparks:

- Skatedots, or integrated skateable terrain, of 20 to 1,500 square feet.
- Skatespots, neighborhood facilities ranging from 1,500 to 10,000 square feet.
- District facilities, meant to serve a larger area and ranging in size from 10,000 to 30,000 square feet.
- Regional facilities, larger than 30,000 square feet and attracting users from around the region.

When the Skatepark Plan was written, the SeaSkate Park at Seattle Center had been closed for development of the Bill and Melinda Gates Foundation Campus, and the City was looking for a

replacement location. One of the recommendations of the Skatepark Plan was to collaborate with Seattle Center to "find a replacement site for SeaSkate somewhere in the downtown core" (SPR, 2007).

7.3 AFFECTED ENVIRONMENT

7.3.1 Study Area

The primary study area for recreation is Seattle Center (Figure 7-1), and the secondary study area is Uptown (Figure 7-2). Recreational facilities within the project site, including KeyArena, Seattle Center Skatepark, and the Seattle Center Pavilion, are described in Section 7.3.2. Recreational facilities adjacent to the project site are described in Section 7.3.3. Other recreation at Seattle Center is described in Section 7.3.4, and other recreation in Uptown is described in Section 7.3.5.

7.3.2 Recreation Within the Project Site

KeyArena

KeyArena is a sports, entertainment, and concert arena with an approximate 11,000 to 17,500-seat capacity, depending on the type of event. The arena was the home arena for the Seattle SuperSonics from 1967 to 2008. KeyArena is owned by the City and currently operated by AEG Facilities (Seattle Center, 2017c).

Recreational events at KeyArena, based on the 2016 and 2017 Seattle Center Events Attendance Rosters (Seattle Center, 2016, 2017b), include the following:

- **Concerts**. A range of artists perform at KeyArena, which hosted over 20 concerts in 2016 (including Adele, Bruce Springsteen, Rihanna, and The Who) and over 25 in 2017 (including Arcade Fire, Janet Jackson, and Macklemore, among other major acts).
- **PAC12 Women's Basketball Tournament.** The PAC12 Women's Basketball Tournament has been held in KeyArena since 2013 and was under contract to be held in KeyArena through 2019.
- **Seattle Storm (WNBA).** The Seattle Storm is a franchise in the Women's National Basketball Association (WNBA). The Storm was founded in 2000 and has used KeyArena as its home arena for its entire history. The Storm hosts 17 regular season games, 1 pre-season game, and a variable number of post-season games at KeyArena (WNBA, 2017).
- **Seattle University Men's Basketball.** The Seattle University Men's Basketball Team play Division I National Collegiate Athletic Association (NCAA) basketball, with KeyArena as their home court. The team played at the Seattle Center Coliseum from 1964–1980 and returned to KeyArena in 2008.
- **Other**. KeyArena hosts a variety of other events. In 2016: The International (Dota 2 esports tournament), the Harlem Globetrotters, Kellogg's Tour of Gymnastics, Marvel Universe Live, the Comedy Get Down, and WWE Raw. In 2017: Big3 Basketball, the Game of Thrones Live Concert Experience, the Harlem Globetrotters, Jim Gaffigan (comedy), Stars on Ice, the WNBA All Star Game, and WWE Smackdown.

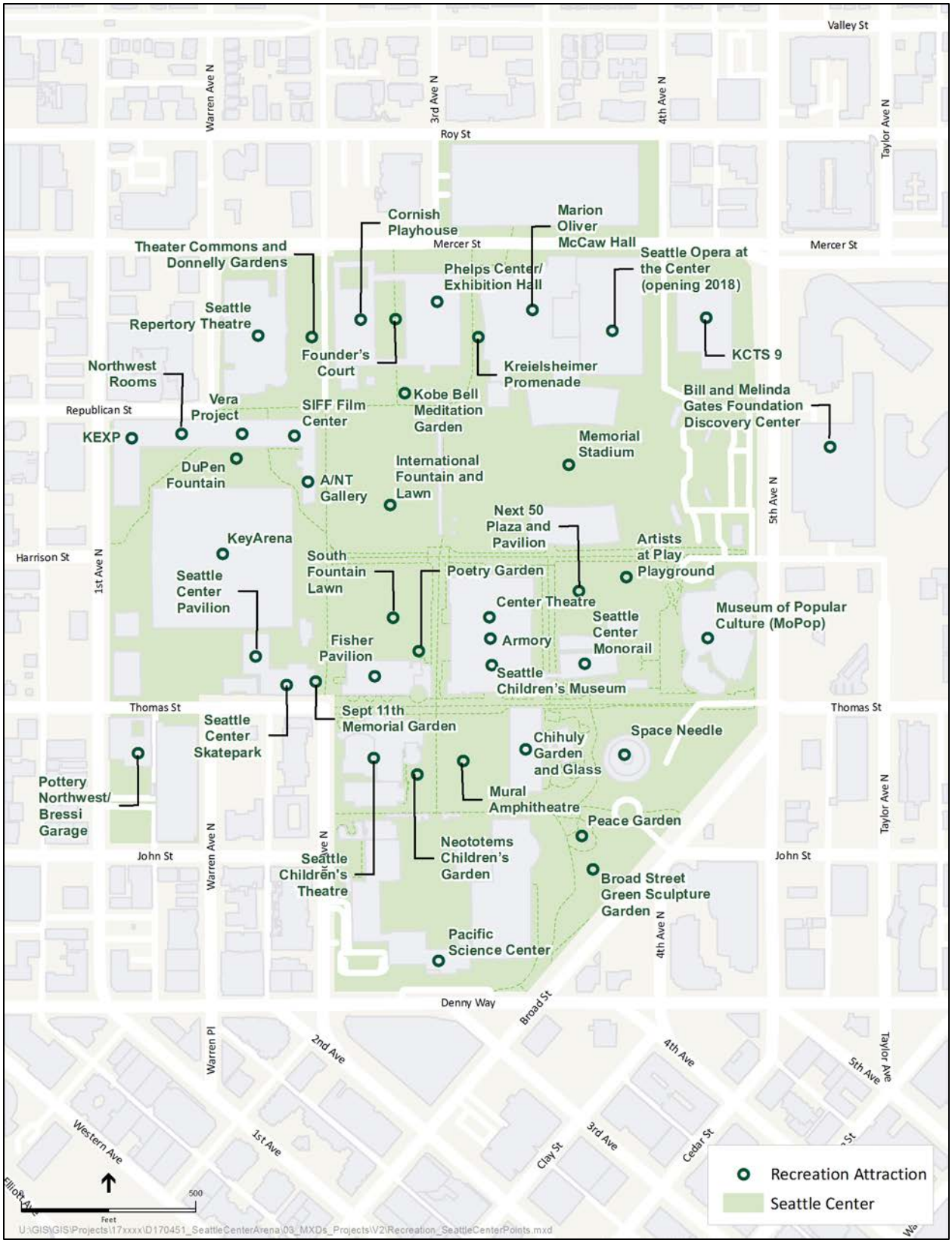


Figure 7-1. Recreational Attractions at Seattle Center

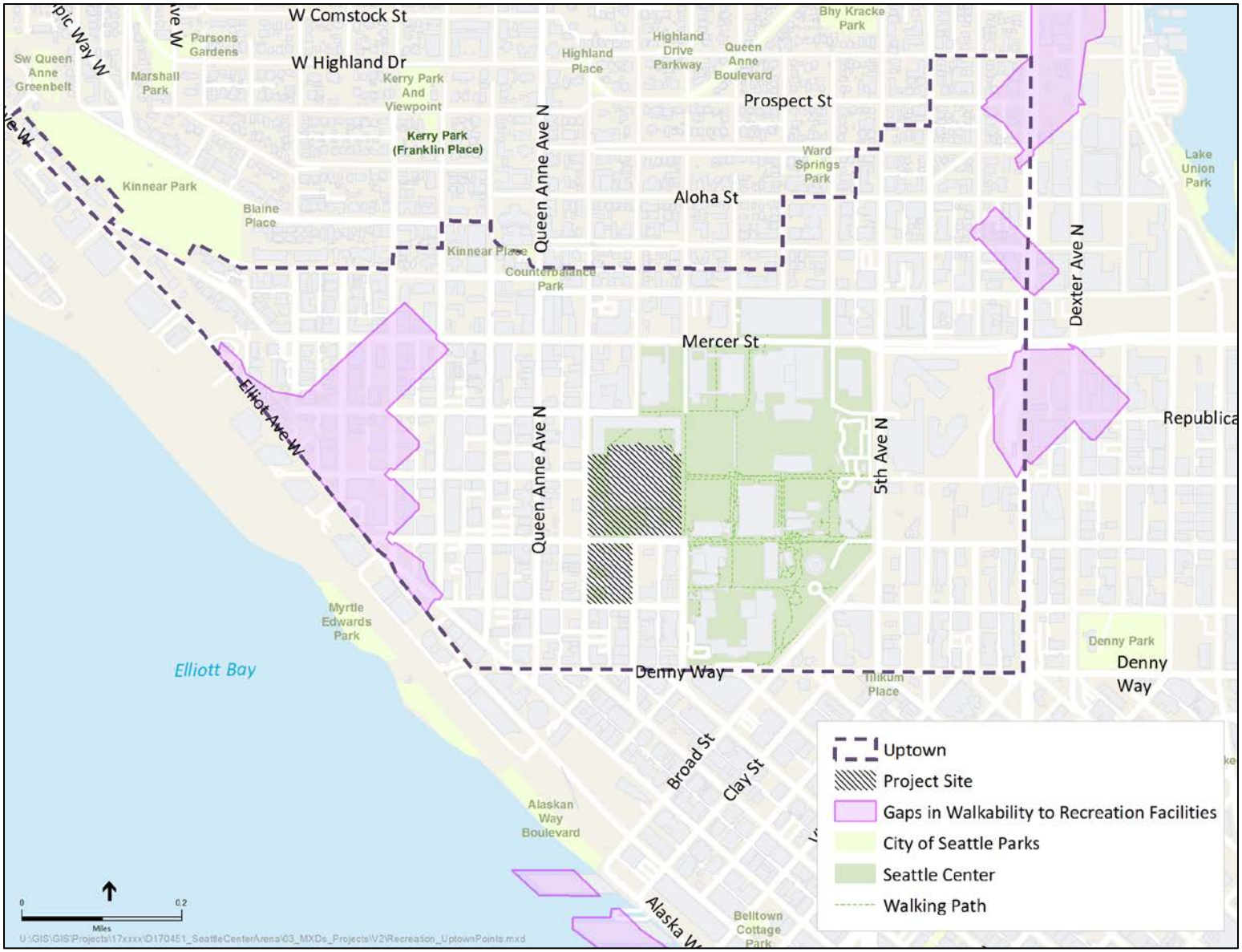


Figure 7-2. Recreation in Uptown

In addition to the recreational events listed above, KeyArena has hosted several non-recreational events, including the annual Seattle/King County Clinic, high school graduations, WE Day, and a Bernie Sanders rally in 2016. KeyArena also hosts occasional private events.

Seattle Center Skatepark

The Seattle Center Skatepark, also known as "SeaSk8," is directly southeast of KeyArena. The skatepark opened in 2009 and features 10,000 square feet of skating elements, including ledges, stairs, and transitions for various skill levels and structural glass riding surfaces (Seattle Center, 2017a).

The skatepark is open to the public during daylight hours. The skatepark occasionally hosts events. For example, in 2016, the skatepark hosted Go Skateboarding Day and a series of Skate Like a Girl classes (Seattle Center, 2016).

The original skatepark at Seattle Center was removed in 2007 for construction of the Bill and Melinda Gates Foundation Campus (SPR, 2007). The current location was constructed to replace that skatepark.

Seattle Center Pavilion

The Seattle Center Pavilion is a 5,300 square foot pavilion with 2 meeting rooms, a lobby, and restrooms. The Pavilion includes exhibit and trade-show space for up to 60 booths and hosts cultural events, workshops, gaming events, exhibitions, conventions, and craft events (Seattle Center, 2016, 2017b, 2017d). No permanent concessions, businesses, or other recreational facilities are located in the Seattle Center Pavilion.

7.3.3 Recreation Adjacent to the Project Site

Recreational facilities adjacent to the project site include the DuPen Fountain (Fountain of Creation), the International Fountain and Lawn, and South Fountain Lawn. Additionally, tenants in the adjacent Northwest Rooms and Bressi Garage program recreational activities.

The DuPen Fountain is directly north of KeyArena. The fountain consists of a bronze and stone water garden and is used for wading. It was created by Everett DuPen in 1962 and renovated in 1992. The International Fountain and Lawn and South Fountain Lawn are east of KeyArena. The International Fountain is a large concrete fountain accessible for wading.

Tenants in the Northwest Rooms and Bressi Garage, including KEXP, the Vera Project, the SIFF Film Center, the A/NT Gallery, and Pottery Northwest, draw visitors for recreational events including live music performances and concerts, classes, exhibitions, lectures, film screenings, and art viewing.

7.3.4 Seattle Center

Seattle Center is a 74-acre campus in Uptown featuring arts, cultural, sports, and entertainment attractions. Seattle Center is one of the top attractions in the region, welcoming millions of visitors annually. Seattle Center was opened in 1962 as the site of the 1962 World's Fair. Seattle Center is owned and operated by the City.

Seattle Center features over 40 recreational attractions. Major recreational features at Seattle Center include the Seattle Repertory Theatre, Marion Oliver McCaw Hall (home of the Seattle Opera and Pacific Northwest Ballet), Memorial Stadium, the Armory, the Museum of Pop Culture (MoPop), Seattle

Children's Theatre, the Mural Amphitheatre, Chihuly Garden and Glass, the Space Needle, the Artists at Play playground, the Seattle Children's Museum, and the Pacific Science Center. A variety of recreational, entertainment, sports, and performance events are held at venues around Seattle Center, including film screenings, theater performances, opera, ballet, sports events, and summer camps. Appendix E includes more information on recreational attractions at Seattle Center and the events held there.

Seattle Center hosts a number of recurring Center-wide events that draw large crowds, including the Northwest Folklife Festival, Bumbershoot, Seattle PrideFest, the Seafair Torchlight Fanfest, the Bite of Seattle, and Winterfest. Appendix E includes more information on Seattle Center events.

7.3.5 Uptown

As described above in Section 7.2.2, most of Uptown is not within walking distance (defined as a 5-minute walk within an Urban Village) of an SPR park greater than 10,000 square feet in size (SPR, 2017b). Including Seattle Center, the majority of the neighborhood is within walking distance of a recreational facility, although 4 areas of Uptown are still not within walking distance of a park (SPR, 2017b). While Seattle Center provides extensive open space and a range of recreational attractions, Uptown still lacks some recreational features typically provided by city parks, such as athletic fields and basketball hoops.

The only City park in Uptown is Counterbalance Park at the corner of Queen Anne Ave N and Roy St. The park, opened in 2008, is a flat lot with gravel and benches. At night, the park features multi-colored light shows on the concrete walls along 2 sides of the park (SPR, 2017c). As a densely populated residential neighborhood, Uptown is also the site of informal recreational use of roads and sidewalks for walking, jogging, and biking. Commercial areas on Queen Anne Ave N, 1st Ave N, and Mercer St and surrounding Seattle Center include restaurants, bars, shops, the On the Boards performance venue, and the SIFF Cinema Uptown theater (operated by the Seattle International Film Festival), all of which are frequented by visitors to Seattle Center and are a recreational draw to the neighborhood in their own right.

In 2017, Uptown was designated an Arts & Cultural District by the Office of Arts & Culture because of its concentration of arts and culture spaces and activities. The Uptown Arts & Culture Coalition advocates for the neighborhood as an Arts & Cultural District.

7.4 POTENTIAL IMPACTS

7.4.1 Construction Impacts

Potential short-term impacts on recreation include the loss of a recreational use during construction activities. The magnitude of the potential impact on recreation is classified as less-than-significant or significant. Significant impacts are defined below, and impacts not reaching that threshold are considered less than significant.

Criteria for Significant Construction Impacts: The impacts of construction activities would be significant if construction were to displace recreational features or programming that cannot be accommodated elsewhere in the greater Seattle area or for which equivalent recreational opportunities are not available.

No Action Alternative

Under the No Action Alternative, no major construction would occur at the KeyArena site. Construction associated with other projects at Seattle Center, private development in Uptown, and transportation projects in the area could cause noise, traffic, and detours that would be noticeable to people using Seattle Center for recreation.

Alternative 1: OVG Proposal

Recreational features within the project site include KeyArena, the Seattle Center Skatepark, and the Seattle Center Pavilion. Impacts to the Seattle Center Skatepark and Seattle Center Pavilion would be permanent and are therefore described in Section 7.4.2, *Operations Impacts*. During the approximately 24-month construction period, KeyArena would be closed and no arena would be available at Seattle Center. This would impact concerts, the PAC12 Women's Basketball Tournament, the Seattle Storm, the Seattle University Men's Basketball Team, and other recreational events currently held at KeyArena.

Arena-scale concerts and other recreational events would not be held at Seattle Center during the approximately 24-month construction period. This impact would be less-than-significant because capacity at other arenas in the greater Seattle area is sufficient to absorb concert dates that would otherwise have been scheduled at KeyArena during the construction period. The Tacoma Dome in Tacoma is an arena with a capacity of 23,000 (depending on the seating arrangement) that frequently hosts concerts on the same scale as those held at KeyArena (Tacoma Dome, 2016). The Tacoma Dome is currently being renovated, and renovations will be complete by fall of 2018 (Tacoma Dome, 2016). Other arenas in the greater Seattle area that could host concerts during the construction period include the ShoWare Center in Kent (capacity 6,500) and Xfinity Arena in Everett (capacity 10,000). There would be no arena venue for concerts within the City of Seattle, although other concert venues of various sizes are available in the city. People seeking to see concerts could travel to Tacoma, Kent, and Everett to attend arena concerts. This could be inconvenient or impractical for some concert goers and more convenient for others. Larger events at Seattle Center, such as Bumbershoot, sometimes use KeyArena as one of a number of venues on the campus. During construction, these events could be accommodated in other Seattle Center facilities.

The Seattle Storm would not be able to play in an arena at Seattle Center for up to 2 seasons (in 2019 and 2020). The Storm would likely relocate to Alaska Airlines Arena (capacity 10,000), the Tacoma Dome, Xfinity Arena, or the ShoWare Center during the construction period. Temporary relocation of the team would inconvenience some fans and could potentially decrease attendance. However, the team draws attendance from the greater Seattle area, so relocation of the team could be more convenient for other fans. This impact would be temporary, and it is common for professional sports teams to relocate during arena or stadium construction timeframes. Because the team could be accommodated elsewhere in the greater Seattle area and because the relocation would be temporary, this would be a less-than-significant impact.

Because KeyArena would not be available in 2019, the PAC12 Women's Basketball Tournament would relocate. The PAC12 has announced that the tournament will move to Las Vegas during construction (Allen, 2018). College basketball fans could attend Washington Huskies men's or women's basketball games at Alaska Airlines Arena, or Seattle University men's or women's basketball games at the Connolly Center. Therefore, this impact would be less-than-significant.

The Seattle University Men's Basketball Team also would be displaced from KeyArena during the construction period. The Seattle University campus features the Connolly Center, a 999-seat arena with an NCAA-regulation court. The men's basketball team would be expected to play at the Connolly Center during the construction period, where it played until 2008 and where the Seattle University Women's Basketball Team currently plays. Because the Connolly Center is available, displacement of the team during the construction period would be a less-than-significant impact.

Construction would also affect recreation adjacent to the project site and elsewhere at Seattle Center. The DuPen Fountain would be closed to the public during a portion of or the full duration of the 24-month construction period. Because other fountains are available on the Seattle Center campus, including the International Fountain and the Fountain of the Northwest, this would be a less-than-significant impact.

Construction impacts to tenants in the Northwest Rooms and Bressi Garage are described in Chapter 3, *Land Use,* and Chapter 8, *Noise and Vibration*. Some recreational programming provided by those tenants, such as concerts at KEXP and pottery classes at Pottery Northwest, may be less frequent or unavailable during the construction period. Because other opportunities for this programming are available in the Seattle area, this would be a less-than-significant impact. Construction activities, including the closure of 2nd Ave N on the Seattle Center campus, would be audible and visible for visitors to recreational programming in the Northwest Rooms and potentially for visitors to the International Fountain and Lawn and South Fountain Lawn. Disruption from visible and audible construction activities would be temporary and would be a less-than-significant impact.

Construction of the Seattle Center Arena would also be noticeable to recreationists at other facilities and amenities at Seattle Center and attendees at major events like the Bite of Seattle, Folklife, Bumbershoot, Festál, parades, walks, and runs. Construction noise would be audible at other Seattle Center facilities; additional information on potential noise construction impacts is included in Section 8.5, *Noise and Vibration*. The City and OVG would enter into a Seattle Center Development Agreement that would outline how construction activities would be managed to minimize impacts to Seattle Center visitors. Disruption from construction activities would be temporary and would be a less-than-significant impact.

Streets around Seattle Center could be closed or used for haul routes during construction. Street closure would require permits from SDOT and would affect event load-in/load-out and school bus parking. Portions of the 1st Ave N Garage would be closed and used for staging during construction. Access to Seattle Center facilities and other parking garages would be maintained throughout construction. However, some visitors to Seattle Center would notice, and could be temporarily delayed by, construction use of adjacent streets during the 24-month construction period. These impacts would be short-term and less-than-significant.

Alternative 2: Modified Proposal

Construction impacts of Alternative 2 on recreation would be similar to those described for Alternative 1, but the duration of construction would be approximately 6 months longer, increasing the amount of time recreation in the area would be impacted.

7.4.2 Operations Impacts

Potential impacts on recreation include the loss of a recreational use or a substantive change in the overall user enjoyment or recreational experience. Significant impacts are defined below, and impacts not reaching that threshold are considered less-than-significant.

Criteria for Significant Operations Impacts: The impact of operations activities would be significant if operations were to permanently displace current KeyArena programming or sports teams that cannot be accommodated elsewhere in the greater Seattle area; or to cause a loss of a recreational use at Seattle Center that is not replaced or available elsewhere at Seattle Center or in or near Uptown.

No Action Alternative

Under the No Action Alternative, KeyArena would continue to be the venue of a number of recreational activities, including concerts, the Seattle Storm, and the Seattle University Men's Basketball Team. The PAC12 Women's Basketball Tournament could take place in KeyArena in 2019.

KeyArena would continue to be an undersized facility that is not suitable for NHL or NBA teams, as determined in a 2015 study (AECOM, 2015). The study also found the arena is unlikely to support alternative entertainment and recreation concepts (AECOM, 2015). KeyArena, which was last renovated in 1995, would continue to age, reducing its ability to compete with other venues as a regional recreational facility. The arena would require an investment in deferred major maintenance.

Recreational activities would continue to occur at the Seattle Center Skatepark and the Seattle Center Pavilion. Pottery Northwest would continue to operate out of the Bressi Garage in its current configuration.

Alternative 1: OVG Proposal

A renovated arena would provide Seattle Center and the City with an updated sports and entertainment arena that could accommodate NHL and NBA teams. The Seattle Center Arena would provide an upgraded facility for existing recreational events such as concerts and the Seattle Storm. The Seattle University Men's Basketball Team would not return to the Seattle Center Arena following construction but would likely play in the Connolly Center. The Seattle Center Arena could potentially also be the home arena for NHL and NBA teams, bringing new recreational opportunities to the greater Seattle area and the State of Washington.

The Seattle Center Pavilion would be demolished and not replaced. This would cause a loss of 5,300 square feet of pavilion space. However, other exhibition space is available at Seattle Center that could hold events. The Armory Loft meeting rooms accommodate similarly sized events to those currently held at Seattle Center Pavilion. In addition, Fisher Pavilion features 12,500 square feet and the Exhibition Hall features 34,000 square feet. No permanent concessions, businesses, or recreational facilities are located in the Seattle Center Pavilion that would be displaced by demolition of the building. Because recreational uses at the Seattle Center Pavilion can be accommodated elsewhere at Seattle Center, this would not be a significant impact.

The Seattle Center Skatepark would also be demolished. However, part of the Memorandum of Understanding (MOU) for the Seattle Center Arena Renovation Project includes funding to the City to replace the skatepark off-site. The site of the replacement skatepark has not yet been determined, but it is intended to be as near as possible to the existing location. Depending on the site selected, the

skatepark may be smaller or have a different configuration than at the current location. There would likely be a time gap between demolition of the existing skatepark and opening of the new skatepark. However, the recreational use (skateboarding) would be replaced. If the replacement skatepark is not located within or adjacent to Uptown, this recreational use would be lost for the neighborhood, which would be a significant impact. If the replacement skatepark is within or adjacent to Uptown, the impact would be less-than-significant.

The City would work with the skateboarding community in Seattle to identify a location for the replacement skatepark. The new skatepark would likely be located on an existing site owned by the City of Seattle, such as a park. The new skatepark would displace whatever use is currently occurring at that location, likely a recreational use if the skatepark is located in a park. However, it would likely be possible to site the skatepark in an open space area of an existing park that would feature other open space areas that could continue to be used by recreationists. The addition of a skatepark would increase the recreational amenities and uses available at the site where it is installed. However, it may be considered an impact by existing users of the site. Seattle Center would consider these benefits and impacts for all potential skatepark sites.

Following construction, Pottery Northwest would return to Bressi Garage and would continue to operate and provide recreational programming out of its current location.

Events at Seattle Center Arena could cause noise that would be noticeable and potentially distracting at other Seattle Center facilities, particularly adjacent facilities like the DuPen Fountain, KEXP, SIFF Film Center, Vera Project, and A/NT Gallery. NHL and NBA games would most frequently be held in the evening, when outdoor activities at Seattle Center are generally less frequent, reducing the number of recreationists who would be subject to noise from operation of the new Seattle Center Arena. The noise from events at the arena would not be noticeably louder than existing conditions, but events would be more frequent. More detail on noise impacts is included in Section 8.5, *Noise and Vibration*. These impacts would not displace any recreational activities and therefore would be less-than-significant.

The Seattle Center Arena would be consistent with the Seattle 2035 Comprehensive Plan and 2017 Parks and Open Space Plan, and would contribute to meeting the goal (in each plan) of providing a variety of indoor recreation spaces. The project was not planned for in the vision for KeyArena included in the Seattle Center Century 21 Master Plan; however, the project is consistent with and would contribute to meeting the goals of the plan. Removal of the skatepark is not consistent with the goals of the Citywide Skatepark Plan; however, finding a replacement site for the skatepark would be consistent with the Skatepark Plan.

Alternative 2: Modified Proposal

Recreational impacts would be the same as those described for Alternative 1.

7.5 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

7.5.1 Construction

Mitigation measures for construction traffic, parking, noise, and aesthetic impacts are described in Section 4.5.1, *Transportation*, Section 8.6.1, *Noise and Vibration,* and Section 9.6.1, *Visual Resources.* The project would obtain permits and approvals required by the City of Seattle for construction activities, including traffic and noise. Seattle Center and OVG are working on a Development Agreement that will outline how construction activities would minimize impacts to Seattle Center during construction.

To avoid conflicts caused by the unavailability of KeyArena during construction, Seattle Center is no longer scheduling events during the planned construction period, and is working with already scheduled events that would need to be moved. The contract between the Seattle Storm and the City includes funding allocated to the Storm to cover relocation costs.

7.5.2 Operations

As described in Section 7.4.2, the City would replace the skatepark. OVG would assume the City's lease with the Seattle Storm or develop a new agreement with the team. To ensure that there would be no long-term impacts to recreational programming, OVG would provide the City with rent-free use of the arena for up to 14 non-consecutive days per calendar year for community events, including the Bumbershoot festival. OVG would provide for the return of Pottery Northwest to the Bressi Garage building.

Mitigation measures for operations impacts to traffic and parking are described in Section 4.5.2, *Transportation*, and mitigation measures for operations impacts to noise are described in Section 8.6.2, *Noise and Vibration.*

7.6 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON RECREATION

If the replacement skatepark is not located within or adjacent to Uptown, this recreational use would be lost for the neighborhood, which would be a significant impact. However, this impact could be avoided if a location for a replacement skatepark can be found within or adjacent to Uptown. There would be no other significant and unavoidable adverse impacts on recreation from either action alternative.

8.0 NOISE AND VIBRATION

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound, which is characterized by various parameters such as the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). The sound pressure level is the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), a logarithmic loudness scale with 0 dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain (Figure 8-1). Because sound pressure can vary by over 1 trillion times within the range of human hearing, the logarithmic loudness scale is used to calculate and manage sound intensity numbers conveniently.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. Therefore, when assessing potential noise impacts, sound is measured using an electronic filter that deemphasizes the frequencies below 1,000 hertz (Hz) and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). All quantified decibel estimates in this EIS analysis are in reference to A-weighted decibels.

Given the variation of community noise level from instant to instant, community noise levels must be measured over an extended period of time to characterize a community noise environment and evaluate cumulative sound impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are as follows.

Steady-state sound is sound for which average characteristics remain constant in time (e.g., the sound of an air conditioner, fan, or pump) and is typically described using the L_{eq} descriptor. Impulse sound is sound generated over a relatively short duration (e.g., a car horn or back-up alarm). Impulsive sound is typically characterized using the L_{max}.

Key Findings for Noise and Vibration

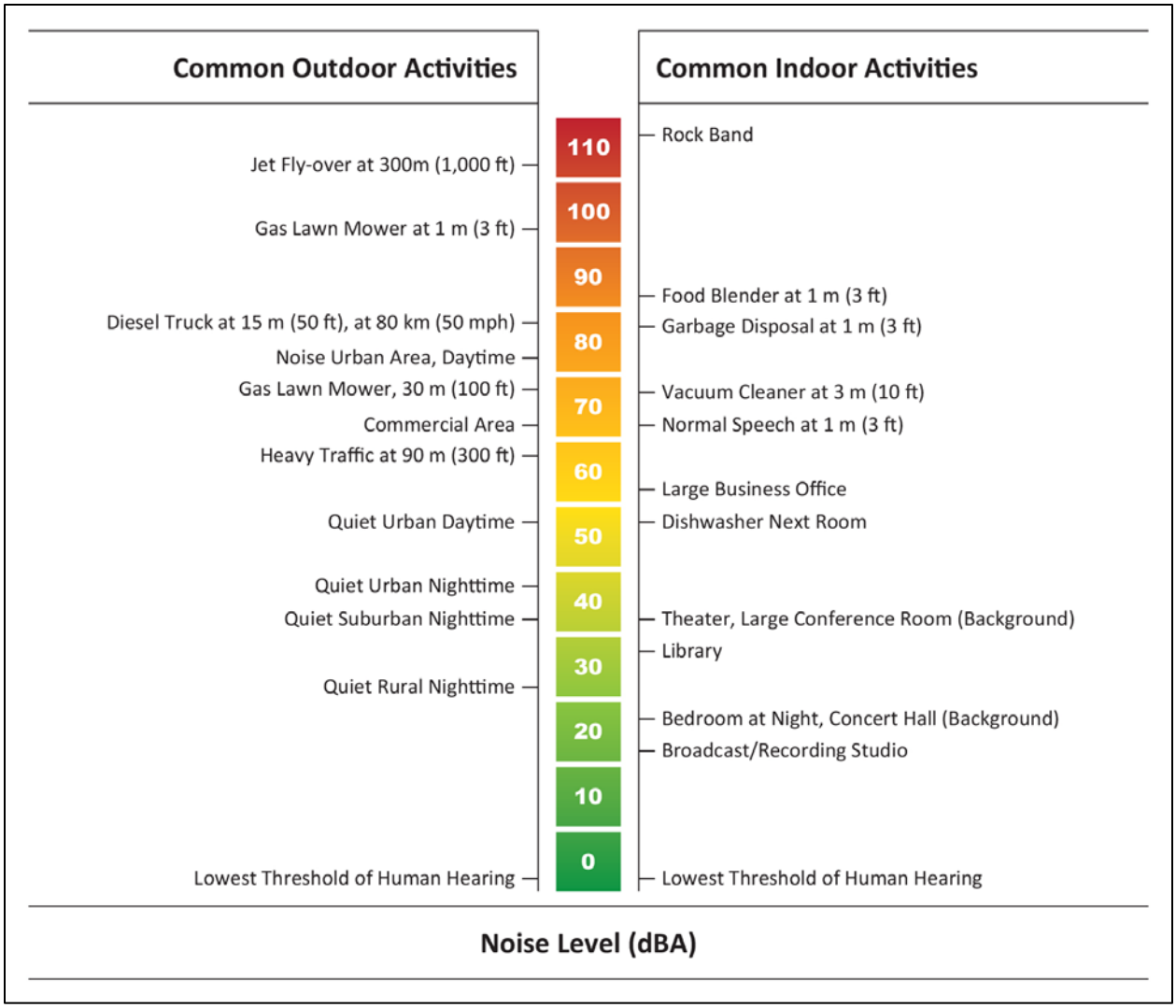
During the day-time construction for either Alternative 1 or 2, the project would temporarily increase noise, but the increase would generally not create substantial annoyance or disruption. However, impacts from noise would be significant to the operation of the recording studio at KEXP in day-time hours. Night-time construction noise with Alternative 1 would be above the limits established in the City Code, which would result in noticeable and potentially disruptive impacts to nearby residents. This would be a significant impact. Impacts from increased construction trucks would be less-than-significant.

During construction, vibration impact equipment would generate vibration levels below the Federal Transit Administration (FTA) threshold levels at the nearest residential receptors, which is not likely to cause negative impacts. However, vibration levels would be above the 0.5 in/sec PPV criteria for the Northwest Rooms building; this would be a significant impact to the building. Additionally, KEXP operates adjacent to the northwest corner of the arena and the perimeter excavation area, where vibration levels would be above FTA thresholds established for recording studios; this would be a significant impact. Other tenants in the Northwest Rooms (the Vera Project and SIFF Film Center) may also be impacted by the noise and vibrations.

Under Alternative 2, no night-time construction would occur, which would extend the construction period by 6 months or longer. During operation, event-related noise would not increase more than 5 dBA Leq over existing ambient noise levels, which would be marginally noticeable to most receptors.

The number of events would more than double, but the noise level within a single hour would be similar to levels that currently occur, and would not constitute an impact. Levels are already above the 75 dBA Lmax limit set by SMC 25.08.410(A).

Operation of amplified equipment would be required to comply with the SMC.



Source: Caltrans, 2009.

Figure 8-1. Perceptible Noise Thresholds

8.1 EFFECTS OF NOISE ON PEOPLE

The effects of noise on people can be placed into 3 categories: (1) subjective effects of annoyance, nuisance, and dissatisfaction; (2) interference with activities such as speech, sleep, and learning; and (3) physiological effects such as hearing loss or sudden startling.

Because of the variation in individual noise thresholds, an important way of predicting human reaction to a new or changed noise environment is the way the noise levels compare to the existing environment to which one has adapted, or the “ambient” noise level. In general, the more a new noise exceeds the existing ambient noise level, the less acceptable the new noise will be to the individual. Evaluations conducted by the Federal Highway Administration (FHWA) are widely used to characterize the relationships relative to increases in A-weighted noise levels. Similar evaluations have not been conducted in Washington.

With regard to increases in A-weighted noise levels, the following relationships occur (FHWA, 2011):

Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived by the human ear.

Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.

A change in level of at least 5 dBA is required before any noticeable change in human response would be expected.

A 10-dBA change is subjectively heard as approximately a doubling in loudness and can cause an adverse response.

Key Terms for Noise Analysis

Leq: The average noise exposure level for a given time period.

Lmax: The instantaneous maximum noise level measured during the measurement period of interest.

Ldn: The energy average of the A-weighted sound levels occurring during a 24-hour period, accounting for the greater sensitivity of most people to night-time noise by weighting ("penalizing") night-time noise levels by adding 10 dBA to noise between 10:00 PM and 7:00 AM.

CNEL: The Community Noise Equivalent Level is the average A-weighted noise level during a 24-hour day that is obtained after an addition of 5 dBA to measured noise levels between the hours of 7:00 PM to 10:00 PM and after an addition of 10 dBA to noise levels between the hours of 10:00 PM to 7:00 AM to account for noise sensitivity in the evening and night-time, respectively.

L10 & L90: L10 and L90 are standard measures that represent the noise levels that are equaled or exceeded 10% and 90% of a specified time period, respectively.

8.1.1 Vibration Fundamentals and Descriptors

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Groundborne vibration causes buildings to shake and generates audible rumbling sounds (FTA, 2006). Vibration levels can also result in interference or annoyance impacts at residences or other land uses where people sleep, such as hotels and hospitals. Some common sources of groundborne vibration, such as construction activities, involve operating heavy earth-moving equipment. Vibration intensity is generally expressed as peak particle velocity (the maximum speed that the ground moves while it temporarily shakes, referred to as PPV). Since ground-shaking speeds are very small, PPV is measured in inches per second (in/sec). The PPV is defined as the maximum instantaneous peak of the vibration signal and is frequently used to describe physical vibration impacts on buildings. Another useful vibration descriptor is known as vibration decibels, or VdBs. VdBs are generally used when evaluating human response to vibration, as opposed to structural damage (for which PPV is the more commonly used descriptor). Vibration decibels are established relative to a reference quantity, typically 1×10^{-6} in/sec (FTA, 2006).

Types of construction activities associated with groundborne vibration include pile driving, use of hoe rams for demolishing large concrete structures, and drilling. Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration.

8.1.2 Sensitive Receptors

Noise

Sensitive receptors for noise include land uses such as hospitals, nursing homes, senior citizen centers, schools, churches, libraries, recording studios, concert halls, and residences (FTA, 2006). The sensitive receptors for noise nearest the project site are residential, church uses, recording studios, and a private school that is scheduled to open in 2018. The nearest residence, the Astro Apartments, is a multi-use

structure that includes a daycare (MightyKidz) on the first floor with residential above, and is 185 feet west of the arena on 1st Ave N. The nearest church, Sacred Heart of Jesus Catholic Church, which includes a shelter for women and children with 30 beds, is 250 feet south of the arena and approximately 50 feet south of the project site. The nearest school facility, the Downtown (Lakeside) School at 204 Warren Ave N, is about 200 feet east of the 1st Ave N Garage and 300 feet south of Seattle Center, and is scheduled to open in fall 2018. KEXP includes a recording studio, and is located immediately northwest of the existing arena (in the U-shaped Northwest Rooms). Performance spaces, are not considered sensitive receptors for noise by FTA (such as the SIFF Film Center, the Vera Project, Seattle Children's Theatre, Seattle Repertory Theatre, and Cornish Playhouse) but are considered in this EIS because they share similar characteristics to concert halls, which are sensitive receptors.

Vibration

The designation of vibration-sensitive land uses depends not only on the type of activities commonly associated with a given land use, but also considers nearby structures that could be damaged by vibration-inducing activities. High-sensitivity uses include land uses where vibrations would interfere with interior operations and include hospitals, research operations, television and recording studios, and concert halls. KEXP has a recording studio, which is a high-sensitivity use with respect to vibration. Residential uses or other uses where people normally sleep are also vibration-sensitive, particularly during night-time hours. The nearest such uses are the Astro Apartments (and daycare) and the shelter at Sacred Heart Church. Similar to noise-sensitive receptors, performance spaces (SIFF Film Center, the Vera Project, Seattle Children's Theatre, Seattle Repertory Theatre, and Cornish Playhouse) are considered in this EIS because they share similar characteristics to concert halls, which are sensitive receptors. Art galleries are not considered sensitive receptors, but the A/NT Gallery is discussed due to proximity.

Several structures that may be structurally sensitive to vibration-inducing construction activities are adjacent to proposed excavation and shoring activities. These buildings include Bressi Garage (unreinforced masonry building) and the Northwest Rooms.

8.2 METHODS

To assess potential construction and operations noise impacts, the EIS Consultant Team measured noise levels to characterize the existing environmental noise conditions of the existing arena, and estimate changes to the noise environment from the project's increased frequency and size of events. It is anticipated that the future noise levels will be similar to existing levels as the project is the modification of an existing arena, and would not introduce a new noise source. Environmental noise conditions were assessed by reviewing policies in the Seattle 2035 Comprehensive Plan (2016) and SMC 25.08 Noise Control regulations for construction and operation noise level limits.

For identifying the thresholds of impact, the U.S. Environmental Protection Agency's (EPA) Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with Adequate Margin of Safety (1974) was applied, which considers a 5-dBA increase over ambient noise levels to represent a significant noise impact.

The City of Seattle does not regulate vibration levels. As such, assessment of vibration impacts is commonly based on guidelines within the Federal Transit Administration's 2006 Transit Noise and Vibration Impact Assessment Manual (FTA, 2006). A general assessment of potential vibration impacts on sensitive land use categories was conducted, based on the FTA Vibration Impact Criteria. Vibration

levels would depend on the construction equipment used, the distance to the sensitive categories, and whether the vibration event is transient or continuous.

8.2.1 Noise Monitoring

The existing noise environment was characterized based on short- and long-term noise monitoring conducted in the study area. Noise monitoring was conducted on a non-event day, November 30, 2017; an event day on December 1, 2017; a non-event day on March 8, 2018; and an event day on March 9, 2018. Additional event noise monitoring will be conducted in early summer 2018, and results will be included in the Final EIS. The monitoring results establish a baseline and were used to approximate the potential noise increase associated with the increased frequency and size of future events at the arena with the proposed project.

Weather conditions have an impact on the ambient noise levels in an area. Temperature, humidity, precipitation, and wind can all cause a change in how much noise is produced and how the sound travels. In an area that receives traffic, tires on wet pavement produce 4 to 7 dbA more noise than what would typically be observed in dry conditions (Freitas, 2009). Weather conditions during the noise monitoring periods for the Draft EIS were normal for the winter season with occasional precipitation throughout the measurement periods. Precipitation levels in the study area were less than 0.1 inch on November 30, 2017; 0.1–0.25 inch on December 1, 2017; less than 0.1 inch on March 8, 2018; and 0.25 to 0.5 inch on March 9, 2018 (NOAA, 2018). No atypical noise-generating activities occurred during the monitoring periods.

Short-Term Monitoring

Short-term monitoring was conducted in 2 locations during 2 concert events at KeyArena (Locations 1 and 2 on Figure 8-2). Measurement locations were chosen to approximate the existing setback between the arena and adjacent sensitive receptors, according to the specifications in SMC 25.08.425, which explain the distance at which measurements should be taken to determine outside sound limit exceedances that pertain to construction equipment. The noise meter was placed approximately 5 feet above the ground, and recorded the maximum (Lmax), average (Leq), L10, and L90 noise levels over 10-minute periods between 6:30 PM and 10:45 PM (see Table 8-3, later in this section). A total of 4 measurements adjacent to the Astro Apartments along 1st Ave N, and 3 measurements adjacent to the Sacred Heart of Jesus Catholic Church on Thomas St were taken for each of the 2 concert events.

Long-term Monitoring

Long-term monitoring was conducted at 1 location for a 48-hour periods on November 30, 2017 and Friday December 1, 2017, and on Thursday March 8 and Friday March 9, 2018. (Location 3 on Figure 8-2). The long-term noise meter was programmed for automatic data collection, running concurrent with the short-term measurements. The purpose of the long-term noise measurement was to determine the changes in noise levels within the noise study area for two 24-hour periods: a typical day without an event at the arena, and a typical day with an event at the arena. The long-term monitoring site was located within the right-of-way south of the 1st Ave N and Harrison St intersection, attached to a utility pole near the Astro Apartments.

Figure 8-2. Noise Monitoring Locations

8.3 REGULATORY CONTEXT

Noise impacts are listed as elements that may be examined through the SEPA process, as designated by SMC 25.05.675(B) and (L). Impacts from vibration are also included in this analysis because of its connection with noise-generating construction equipment. Disruption caused by noise and vibration were identified as areas of concern in the scoping comments; both elements are therefore covered in this Draft EIS.

8.3.1 Noise

Washington State Noise Control Act of 1974

Recognizing the harm that excessive noise can have on public health, safety, and well-being, the State of Washington established rules to abate and control noise pollution (RCW 70.107). The regulations on Maximum Environmental Noise Levels (WAC 173.60) apply to a variety of activities and facilities including general construction activities, park-and-ride lots, and maintenance facilities; exemptions include electrical substations, mobile noise sources, vehicles traveling in public right-of-way, as well as safety warning devices such as bells. Most cities in Washington (including Seattle) have adopted the state provisions (SMC 25.08).

Seattle Municipal Code 25.08 - Noise Control

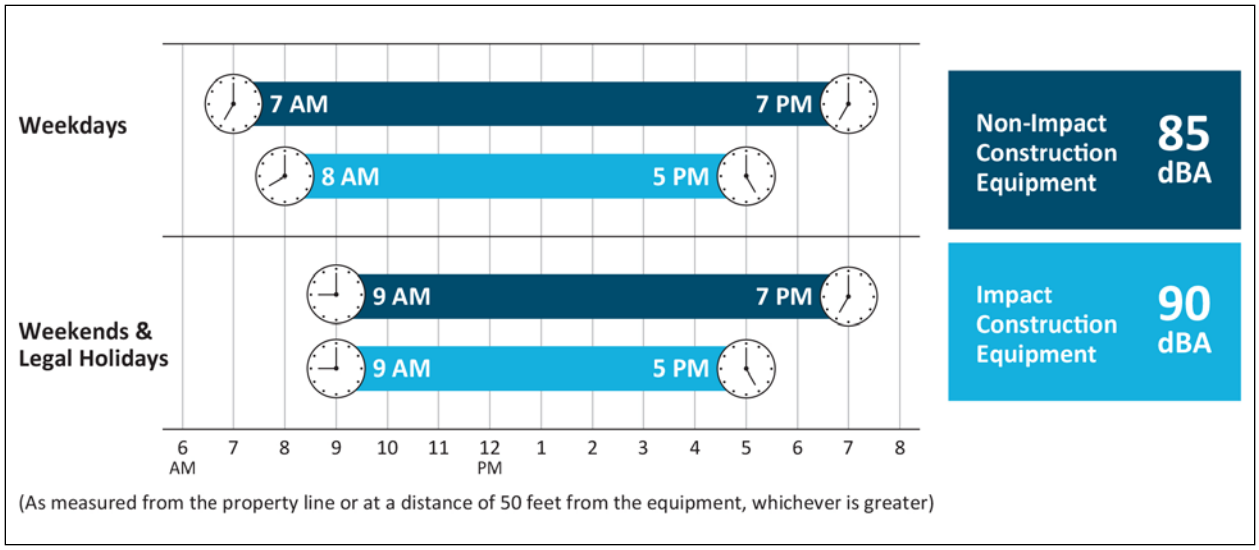
Construction Noise Standards

SMC 25.08 establishes exterior sound level limits for specified land use zones or "districts," which vary depending on the district generating the sound and the district affected by the sound. The project site and surrounding study area are zoned Seattle Mixed-Uptown (SM-UP) (see Section 3.3.5 in Chapter 3, *Land Use*). The SMC 25.08.100 classifies SM zones as commercial districts. The exterior sound level limit applicable to the project site would need to meet the 60 dBA Leq standard for a commercial district generating the sound and a commercial district receiving (or affected by) the sound during construction.

Certain types of construction equipment operating in commercial districts are allowed to exceed exterior sound level limits between 7 AM and 10 PM on weekdays and between 9 AM and 10 PM on weekends and legal holidays (SMC 25.08.425). The types of equipment that would usually exceed the exterior sound level limit of 60 dBA are loaders, excavators, and cranes. The code allows for an exceedance of the 60 dBA standard in commercial zones when measured at a reference distance of 50 feet by up to 25 dBA (an 85 dBA standard) between 7 AM and 7 PM on weekdays and between 9 AM and 7 PM on weekends and legal holidays (Figure 8-3). Use of impact equipment, such as a pile driver or concrete breaker, is restricted to 8 AM to 5 PM on weekdays and 9 AM to 5 PM on weekends and legal holidays, and limited to a continuous noise level of 90 dBA and a non-continuous maximum noise level of 99 dBA Lmax when measured at a reference distance of 50 feet (Figure 8-3).

Operation Noise Standards

The operational exterior noise level applicable to the project site is 60 dBA Leq pursuant to SMC 25.08.410 also allows maximum noise levels of up to 15 dBA beyond this standard (up to 75 dBA Lmax), provided the average hourly noise level attains the 60 dBA standard, meaning that particular activities could be louder than the 60 dBA limit for short durations within a given hour.



Source: Prepared by Environmental Science Associates.

Figure 8-3. Construction Noise Time Limits for Projects in Low-rise, Mid-rise, and High-rise, Residential-Commercial and Neighborhood Commercial Zones under the City of Seattle's Noise Ordinance

8.3.2 Vibration

Construction Vibration Standards

Human Annoyance and Sensitive Equipment

There are no adopted state or local policies or standards for groundborne vibration with regard to human annoyance; however, the FTA has established standards for acceptable levels of vibration associated with impact equipment as experienced by sensitive receptors. Those criteria are established in terms of vibration velocity decibel level (VdB) by land use category (Table 8-1).

Category 1 buildings typically include land uses such as research and manufacturing, hospitals with vibration-sensitive equipment, and university research operations. The vibration limits for Category 1 are based on acceptable vibration for moderately vibration-sensitive equipment such as optical microscopes and electron microscopes with vibration isolation systems (FTA, 2006).

Buildings such as concert halls, TV studios, and recording studios are considered special facilities that can be sensitive to noise and vibration and are evaluated using the same vibration impact levels as for Category 1 land uses (FTA, 2006). It is rare for computer or other electronic equipment to be particularly sensitive to vibration as it is designed to operate in typical building environments where equipment may experience occasional shock from bumping and continuous background vibration caused by other equipment (FTA, 2006).

Structures

There are no adopted state or local policies or standards for groundborne vibration with regard to structures. However, the FTA establishes acceptable levels of vibration associated with equipment potentially causing groundborne vibration on structures. The criteria are established by Peak Particle Velocity (PPV) in in/sec (Table 8-2).

Table 8-1. Vibration Impact Level Limits for Land Uses

Land Use Category	Vibration Impact Level for Frequent Events (VdB)	Vibration Impact Level for Infrequent Events (VdB)
Category 1: Buildings where low ambient vibration is essential for interior operations	65	65
Category 2: Residences and buildings where people normally sleep	72	80
Category 3: Institutional land uses with primarily day-time use	75	83

FTA defines "Frequent events" as more than 70 per day. "Infrequent events" are fewer than 70 per day. "Events" are defined as a vibration occurrence. VdB=vibration velocity level in decibels.
Source: FTA, 2006.

Table 8-2. Guideline Vibration Damage Potential Threshold Criteria for Structures

Structure Type and Condition	Transient Vibration Sources[1]	Continuous Frequent Intermittent Vibration Sources[2]
	Maximum Peak Particle Velocity (PPV), inches per second (in/sec)	
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

[1] Transient sources create a single isolated vibration event, such as blasting or drop balls.
[2] Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: Caltrans, 2013.

As shown, damage thresholds for continuous sources are less than those for single-event or transient sources (Caltrans, 2013).

Operational Vibration Standards

The City has not established regulations with respect to vibration levels. Consequently, this EIS analysis applies the same standards for operational vibration impacts as for construction. In general, operational vibration impacts result from sources such as transit and railroad operations, and mining and blasting activities, and would not be associated with events from the arena.

8.4 AFFECTED ENVIRONMENT

8.4.1 Study Area

The study area for the noise and vibration analysis is shown in Figure 8-2 and is comprised of mixed-use zones that include recreational, commercial, residential, and parking uses, all of which generate and receive noise, and which also receive groundborne vibration. Sensitive receptors for noise and vibration are described in Section 8.1.2.

8.4.2 Existing Noise Environment

KeyArena is in a downtown urban area characterized by activities typical of commercial businesses and dense residential areas. The predominant noise source in the area is vehicular and bus traffic on roads adjacent to the project site. During events at KeyArena, pedestrian activity on the surrounding sidewalks increases just prior to an event start and shortly after its completion. Other typical urban noise sources include emergency vehicles, delivery trucks, and individuals visiting nearby businesses.

Table 8-3 shows the results of the short-term ambient noise measured in the study area during multiple arena events. Measurements were taken at 2 locations during 2 separate large-capacity events at the arena. The first concert event monitored was the A Perfect Circle concert on Friday, December 1, 2017. The concert doors opened at 6:30 PM, the opening act began at 7:30 PM, A Perfect Circle began at 8:30 PM, and the event ended at approximately 10:15 PM. The second concert event monitored was the Lorde concert on Friday March 9, 2018. The concert doors opened at 6:00 PM, the opening act began at 7:00 PM, and the event ended at approximately 10:25 PM. A third concert event will be monitored in the summer of 2018, with results presented in the Final EIS.

Table 8-3. Short-Term Noise Level Data During Concert Events

Measurement Location	Time	Noise Levels in dBA			
		Leq	Lmax	L10	L90
A Perfect Circle Concert December 1, 2017					
1. Astro Apartments nearby residential and daycare receptor 185 feet west of the project site	6:28–6:38 PM	63.3	69.4	66.0	61.0
	7:22–7:32 PM	69.4	72.1	71.0	65.0
	9:25–9:35 PM	62.7	65.4	64.0	60.0
	10:18–10:28 PM	69.1	70.1	70.0	68.0
2. Sacred Heart of Jesus Catholic Church and shelter 250 feet south of the arena and 50 feet south of the project site	6:50–7:00 PM	59.1	61.9	61.0	57.0
	9:06–9:16 PM	62.7	68.9	66.0	58.0
	10:35 PM–10:45 PM	57.7	63.0	61.0	53.0

Measurement Location	Time	Noise Levels in dBA			
		Leq	Lmax	L10	L90
Lorde Concert March 9, 2018					
1. Astro Apartments nearby residential and daycare receptor 185 feet west of the project site	6:33–6:43 PM	69.2	78.7	71.0	65.0
	7:25–7:35 PM	67.2	81.4	69.0	61.0
	9:24–9:34 PM	65.2	75.7	69.0	54.0
	10:25–10:35 PM	66.8	86.8	68.0	63.0
2. Sacred Heart of Jesus Catholic Church and shelter 250 feet south of the arena and 50 feet south of the project site	6:52–7:02 PM	58.3	67.6	61.0	55.0
	9:04–9:14 PM	60.1	78.1	60.0	53.0
	10:39 PM–10:49 PM	63.0	80.3	64.0	59.0

The precision sound level meter was calibrated immediately prior to each measurement date to ensure accuracy.
Source: Field monitoring conducted by Environmental Science Associates, December 1, 2017 and March 9, 2018.

Table 8-4 shows the results of the long-term noise measurements conducted over two 24-hour periods at the same location (Location 3, see Figure 8-2) prior to and during concert events to determine the noise levels within the study area on a day with and without an event.

Table 8-4. Long-Term Noise Level Data in the Study Area

Measurement Period (24 hours, 12 AM–12 AM)[1]	Noise Levels in dBA			
	Day-time Leq	Night-time Leq	24-Hr Leq	Ldn/CNEL
3a. Thursday November 30, 2017 – No concert at KeyArena Nearby residential receptor 185 feet from the project site	70.0	67.0	69.0	74.0
3b. Friday December 1, 2017 – Concert at KeyArena Nearby residential receptor 185 feet from the project site	71.0	65.0	69.0	73.0
3c. Thursday March 8, 2018 – No concert at KeyArena Nearby residential receptor 185 feet from the project site	74.0	67.0	64.0	76.0
3d. Friday March 9, 2018 – Concert at KeyArena Nearby residential receptor 185 feet from the project site	72.0	66.0	63.0	74.0

[1] 3a, 3b, 3c, and 3d indicate different monitoring events at the same location (Location 3).
Source: Field monitoring conducted by Environmental Science Associates, November 30, 2017 – March 9, 2018.

As indicated in Table 8-4, the occurrence of an event at KeyArena did not meaningfully affect the noise levels averaged over the entirety of day-time or night-time periods. The results also indicate that the noise levels were consistent throughout the day and night due to exposure to the same predominant noise source – traffic on a wet surface.

Table 8-5 shows the differences in Leq and Lmax between the peak activity hours of 5:00 PM and 11:00 PM for each of the 2 events monitored. Lmax values can vary widely in urban environments and can

result from sporadic individual events such as car doors slamming shut, motorcycle pass by-events, and emergency vehicle sirens. The data in Table 8-5 indicate that while hourly average Leq noise levels during an event can be as much as 3 dBA greater than that same hour without the event, noise levels during most other hours were similar to hours without an event.

Table 8-5. Comparison of Leq and Lmax between 5:00 PM and 11:00 PM on Non-Event days and Event Days

Time	Leq		Lmax	
	Thursday Nov. 30, 2017 (non-event)	Friday Dec. 1, 2017 (event)	Thursday Nov. 30, 2017 (non-event)	Friday Dec. 1, 2017 (event)
5:00 PM	70	69	90	87
6:00 PM	70	69	89	84
7:00 PM	68	69	86	88
8:00 PM	68	68	90	81
9:00 PM	68	71	83	100
10:00 PM	73	68	103	82
11:00 PM	67	69	85	88
	Thursday March 8, 2018 (non-event)	Friday March 9, 2018 (event)	Thursday March 8, 2018 (non-event)	Friday March 9, 2018 (event)
5:00 PM	72	70	85	83
6:00 PM	72	70	91	86
7:00 PM	71	69	90	88
8:00 PM	69	69	83	83
9:00 PM	69	67	86	84
10:00 PM	68	68	87	84
11:00 PM	66	67	82	82

Source: Field monitoring conducted by Environmental Science Associates.

The results of both the short-term and long-term noise measurements generally reflect existing noise conditions, which are noisy and influenced by typical activities surrounding mixed-use residential and commercial land uses in a downtown urban area.

Noise measurement data sheets for noise monitoring are included in Appendix F.

8.5 POTENTIAL IMPACTS

The project would increase the frequency and capacity of sporting and entertainment events, potentially increasing ambient noise levels to nearby sensitive land uses. This analysis evaluates the potential increase in noise and vibration from both construction and operation of the project and the project's compliance with applicable regulations.

8.5.1 Construction Impacts

Potential short-term noise and vibration impacts from construction are characterized as less-than-significant or significant. Potentially significant impacts are defined below; impacts that do not reach that threshold would be less-than-significant.

Criteria for Significant Noise Impacts During Construction:

Noise generated from standard construction equipment (including off-highway trucks) would expose people to, or generate, noise levels that would result in sustained and substantial annoyance and disruption of activities for receptors, exceeding the limits for commercial districts, as defined in SMC 25.08.425(A) and SMC 25.08.425(B).

Impact equipment, such as jackhammers and pile drivers, would expose people to, or generate, noise levels that would result in sustained and substantial annoyance and disruption of activities for receptors, and would exceed the limits defined in SMC 25.08.425(C).

Criteria for Significant Vibration Impacts During Construction:

Construction activities would generate vibration levels substantial enough to potentially damage nearby structures or buildings, or result in sustained vibration levels established by FTA as an annoyance to sensitive land uses.

No Action Alternative

Under the No Action Alternative, noise and vibration levels associated with KeyArena would remain as they are; no construction would occur and no construction noise or vibration would occur.

Alternative 1: OVG Proposal

Noise

Mobile Sources

Demolition and construction activities that require the use of heavy trucks to off-haul demolition waste would increase hourly noise levels on nearby streets. During construction, the delivery/haul trucks, as well as employee vehicles, would travel to and from the project site daily, although hauling during the AM/PM peak traffic hours is not planned and construction shifts would be staggered to avoid shift changes during AM/PM peak hours. For more information on haul routes and impacts related to AM/PM peak hour traffic, see Chapter 2, *Alternatives*, and Chapter 4, *Transportation*.

Demolition and excavation would occur during approximately the first 6 months of construction and generate approximately 290 truck trips per 24-hour work day, 7 days a week. Truck hauling would be restricted to 18-hour days to avoid peak traffic hours. Trucks would likely access the site from I-5 via Denny Way to 1st Ave N, and use 1st Ave N to Mercer St to access I-5. This primary haul route would locate truck traffic past multiple apartment /condominium buildings on Denny Way and 1st Ave N (Mirabella, Century, Taylor Verve, the Matae, etc.), as well as Seattle Center campus performance spaces (Seattle Repertory Theatre, Cornish Playhouse, McCaw Hall, Seattle Opera at the Center, SIFF Film Center, Seattle Children's Theatre, and Pacific Science Center IMAX theaters). Truck loading activities are considered separately below as a stationary source of construction noise.

The proposed off-haul rate would generate increased truck pass-by events per hour, especially over the first 6-month period. Because trucks would use separate routes to and from the freeway and each trip reflects either a trip to the project site or a trip away from the project site, the increase in pass-by

events for any given receptor along the route in a given hour would be the total number of daily trips divided by 18 hours and divided by 2. Using the FHWA (2004) Traffic Noise Model, noise contributions of these truck trips are estimated to be an hourly Leq of 56.5 dBA at a receptor 33 feet from the center of the roadway (1st Ave N). During day-time hours when traffic on 1st Ave N was monitored to average 70 dBA, Leq, the addition of truck traffic would result in a less-than-noticeable increase of ambient noise levels. During night-time periods when the hourly Leq was monitored to be as low as 61 dBA during the quietest hours, the contribution of truck traffic would result in an increase of 1.3 dBA. Such an increase would be below that considered a barely perceptible change (FHWA, 2011), and the impact of adding 8 truck trips per hour would be less-than-significant, even during the quieter night-time periods.

Stationary Sources

Stationary construction-related activities, which are non-transportation related activities using some or all of the construction equipment listed in Table 8-6, would temporarily increase ambient noise levels in the study area. Construction noise levels surrounding the project site would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. The effect of construction noise would depend on the type of construction activity on a given day and the equipment used, the distance between construction activities and the nearest receptors, and the existing noise levels around the site. Construction of Alternative 1 would occur from October 2018 to October 2020, or approximately 24 months. Construction would occur 24 hours per day and 7 days a week. Initial demolition and excavation would be the most intense period, with frequent use of impact equipment lasting approximately the first 6 months. After the first 6 months, impact equipment would still be used but would be infrequent. Because of the dynamic nature of construction, the sequencing, extent, and timing of construction activities would vary to some degree. Table 8-6 shows the type of equipment that would likely be used for construction of the project.

Table 8-6. Typical Noise Levels from Construction Equipment

Construction Equipment	Noise Level (dBA, Lmax at 50 feet)	Noise Level at Nearest Residential Receptor (dBA, Lmax at 185 feet)
Pile driver	101	90
Hoe ram (concrete breaker) (impact equipment)	90	79
Concrete saw	90	79
Jack hammer (impact equipment)	89	78
Auger Drill	84*	73
Excavator	81	70
Roller	80	69
Concrete mixer	79	68
Crane, mobile	81	70
Bulldozer	82	71
Paver	77	66
Backhoe	78	67
Air Compressor	78	67

*Noise level from auger drill is reported for engine noise only. Augering can also generate noise from shaking the bit to remove sticky soils.
Source: FHWA, 2006.

Day-time: As shown in Table 8-6, all of the equipment identified as likely to be used for Alternative 1 would operate at less than 85 dBA Leq at a distance of 50 feet, except for the pile driver, hoe ram, concrete saw, and jack hammer. The SMC 25.08.425(C) specifically addresses impact equipment, including pavement breakers, by establishing separate time restrictions and noise standards for such equipment. As indicated in Table 8-6, most impact equipment operates at a maximum noise level of 90 dBA Lmax at 50 feet, which would be below the maximum noise level restriction of 99 dBA Lmax and would not exceed the day-time continuous noise level restriction of 90 dBA Leq (averaged over the day-time construction period). Impact equipment including augering, pile driving, and other impact equipment may be required for construction; thus, the potential exists for noise levels in excess of the maximum noise level restriction of 99 dBA Lmax. Therefore, construction activities at the project site under Alternative 1 may not comply with the restrictions of the SMC 25.08.425 during day-time hours due to the use of pile drivers, which would potentially exceed the 90 dBA Leg or the 99 dBA Lmax limits, depending on the location of the noise-producing source.

Night-time: Under Alternative 1, construction on the interior of the building as well as excavation, truck loading and queuing, use of impact equipment, and truck hauling would occur during night-time hours. Installation of soldier piles would occur around the perimeter of the arena foundation and may require the use of impact hammers within 185 feet of the Astro Apartments and 250 feet of the shelter at Sacred Heart Church. Night-time construction would be above the limits set forth in SMC 25.08.425 and have the potential to result in sleep interference when conducted near residential receptors, which would be a significant noise impact. The MightyKidz daycare is a day-time childcare program and thus would not be affected during night-time hours.

Construction activities requiring grading and earth movement would necessitate material and soil to be excavated and loaded onto haul trucks. To achieve the proposed excavation rate, haul trucks would need to be queued up and ready to accept materials outside of the enclosed arena where the excavation would occur. Trucks would be loaded along 1st Ave N in front of the arena just north of the intersection of 2nd Ave N and Thomas St, on the vacated portion of 2nd Ave N, and Thomas St between Warren Ave N and 2nd Ave N. These queuing locations would be within 100 feet of the Astro Apartments and the shelter at Sacred Heart Church. Noise levels of 70 dBA could be expected from excavator operations (see Table 8-6) at the Astro Apartments during night-time hours when existing noise levels are approximately 60 dBA. This 10 dBA increase in existing night-time noise levels would require a variance, and has the potential to result in sleep interference at the nearest receptors, and would be significant.

Excavation of the new underground parking garage and the loading dock immediately south of the arena would be open-pit (non-enclosed). Staging at the 1st Ave N Garage could also be a source of noise. The project would generate approximately 290 daily truck trips over a 6-month period for excavation and demolition, 80–100 daily trips for the next year, and 20–30 daily trips for the last 6 months. These construction activities under Alternative 1 would not comply with the restrictions of the SMC 25.08.425 during night-time hours and could disturb occupants of residential land uses, which would be a significant impact.

Construction noise also has the potential to impact KEXP, SIFF Film Center, and the Vera Project immediately north of KeyArena in the Northwest Rooms. Excavation activities may abut the south ends of the foundation of the Northwest Rooms, and would be up to approximately 115 feet south of the remainder of the U-shaped building (see Figure 2-2 in Chapter 2, *Description of Alternatives*). Noise levels of 81 to 90 dBA could be experienced at the outside of the building. Additionally, impact equipment like pile drivers cause Lmax noise levels up to 101 dBA (measured at 50 feet away), which could interfere with day-time operations and would be a significant construction noise impact to the KEXP operations. Noise level would be less likely to result in a significant impact to SIFF Film Center and

the Vera Project because they are farther away than KEXP from construction. Similarly, these type of construction noises during the day may affect the operations of the Seattle Children's Theatre, Seattle Repertory Theatre, and Cornish Playhouse, but would be less-than-significant.

Night-time construction work would require a variance from the restrictions of the noise ordinance for non-conforming activities. The potential to exceed the noise limits in SMC 25.08.425 during night-time construction activities, including the use of impact equipment and truck queuing and loading would be a non-conforming activity, and therefore would be a significant impact to KEXP, SIFF Film Center, and the Vera Project) when their programming occurs at night. Similarly, night-time construction noises may affect the operations of the Seattle Children's Theatre, Seattle Repertory Theatre, and Cornish Playhouse, but would be less-than-significant. Requirements of the variance process are described in the mitigation measures in Section 8.6.

Vibration

There are no adopted state or local policies or standards for groundborne vibration. However, the FTA has published guidance relative to vibration impacts for construction, and this guidance is commonly applied to assess potential vibration impacts from construction. The average person is quite sensitive to ground motion, and levels as low as 0.02 in/sec can be detected by the human body when background noise and vibration levels are low. Vibration intensity is expressed as PPV, the maximum speed at which the ground moves while it temporarily shakes.

Building Damage

Since groundshaking speeds are very slow, PPV is measured in inches per second. According to the FTA, non-engineered timber and masonry buildings, such as Bressi Garage and the Sacred Heart Church and Shelter, can be exposed to groundborne vibration PPV levels of up to 0.2 in/sec without experiencing structural damage, while reinforced-concrete, steel, or timber buildings, such as the Astro Apartments and Northwest Rooms, can be exposed to PPV levels of up to 0.5 in/sec (FTA, 2006). The nearest structure to the project site is the Northwest Rooms. Excavation under the KeyArena building would extend to the north of the arena structure into the International Plaza and immediately adjacent to the south ends of the Northwest Rooms (see Figure 2-2 in Chapter 2, *Description of Alternatives*). The Addendum to the Final EIS for the Seattle Center Master Plan (Seattle Center, 2016) indicates that the Northwest Rooms underwent structural improvements and modifications to the building shell and core. Consequently, the 0.5 in/sec PPV criteria would apply. KeyArena, the Northwest Rooms, and Bressi Garage are designated as Seattle Landmarks; see Section 6.4, *Historic and Cultural Resources* for a discussion of potential impacts to these Landmark-designated structures.

Table 8-7 presents reference vibration levels at 25 feet as reported by FTA as well as vibration levels at the nearest structure, the Northwest Rooms (at a 10-foot distance to reflect potential impacts from excavation activities, and at a 30-foot distance to reflect potential impacts from pile driving activities at the arena footprint). Installation of piles may be a necessary feature of building renovation during construction. If soldier piles or sheet piles were installed by an impact or vibratory pile driver within 30 feet of an adjacent structure, the potential would exist for building damage to occur, which would be a significant vibration-related impact. Consequently, mitigation is identified in Section 8.6 to require alternative methods of pile installation.

Table 8-7. Construction Equipment Vibration Levels (PPV Metric)

Construction Equipment	Reference Vibration Level (PPV at 25 feet)	Vibration Level (PPV at Northwest Rooms; 10 feet)	Vibration Level (PPV at 30 feet)[1]	Vibration Level (PPV at nearest residence; 185 feet)
Pile driving	0.644 (typical)	1.78	0.53	0.072
Vibratory roller	0.210	0.58	0.17	0.023
Large bulldozer	0.089	0.24	0.073	0.010
Caisson drilling	0.089	0.24	0.073	0.010
Jackhammer	0.035	0.10	0.029	0.004

[1] 30 feet is the approximate minimum distance between the arena roofline and KEXP.
Source: Developed by ESA based on FTA, 2006.

Human Annoyance/Sensitive Building Operations

The closest land uses where people would be expected to sleep would be the Astro Apartments (and MightyKidz daycare) approximately 185 feet from the arena and the shelter at Sacred Heart Church, approximately 250 feet (and approximately 50 feet from the project site). The KEXP recording studio is approximately 30 feet from the northwest corner of the arena, the A/NT Gallery is approximately 25 feet from the northeast corner of the arena, and the Vera Project and SIFF Film Center are approximately 115 feet to the north. The FTA identifies groundborne vibration criteria relative to human disturbance or sensitive equipment operations in terms of VdB, instead of the PPV metric. For both residential land uses where people normally sleep as well as recording studios, the FTA identifies the types of construction activities associated with propagation of groundborne vibration including pile driving, impact equipment (such as hoe-rams) for demolishing large concrete structures, and caisson drilling.

Table 8-8 presents reference vibration levels at 25 feet in the VdB metric as reported by the FTA, as well as estimated vibration levels at KEXP (at a 10-foot distance to reflect potential impacts from excavation activities, and at a 30-foot distance to reflect potential impacts from pile driving activities at the arena) and the nearest residential receptor. However, excavation may abut the south ends of the foundation of the U-shaped Northwest Rooms where KEXP (and the A/NT Gallery) are located. Vibration-inducing construction equipment could have an impact on operations of KEXP, as well as the other tenants in the Northwest Rooms: A/NT Gallery, SIFF Film Center, and the Vera Project. Even at a distance of 100 feet, the threshold for recording studios and concert halls (performance spaces) would be exceeded. Consequently, operation of vibration-inducing construction equipment could result in an impact by disrupting the operations of KEXP and the A/NT Gallery, SIFF Film Center, and the Vera Project if such equipment were to operate within 100 feet or pile driving were to occur within 400 feet. These impacts would be significant for KEXP, and potentially for SIFF Film Center and the Vera Project, because these uses are sensitive receptors whose operations require vibration-free conditions. Impacts to the nearest residential uses could also occur if pile driving were to occur within 200 feet during night-time hours.

Vibration could also be generated by the operation of tunnel boring/mining equipment during tunnel construction under Thomas St and the Bressi Garage. Vibrations from some types of tunnel boring machines are potentially annoying at residential uses closer than 15 feet, and may impact structures at distances closer than 8 feet (Sound Transit, 2011).

Table 8-8. Construction Equipment Vibration Levels (VdB Metric)

Construction Equipment	Reference Vibration Level (VdB at 25 feet)	Vibration Level (VdB at KEXP; 10 feet)	Vibration Level (VdB at 30 feet)	Vibration Level (VdB at nearest residence; 185 feet)
Pile driving	104 (typical)	116	102	78
Vibratory roller	94	106	92	68
Large bulldozer	87	99	85	61
Caisson drilling	87	99	85	60
Jackhammer	79	91	77	53
FTA Criteria Threshold (VdB) for Occasional Events[1]				
Category 1 Land Use (Concert Halls, TV Studios, and Recording Studios)	65			
Category 2 Land Use (Nearest Residence)	80			

[1] Occasional events are defined as fewer than 70 vibration events per day.
Source: Developed by ESA based on FTA, 2006.

Construction Impacts Summary for Alternative 1

Significant impacts associated with construction of Alternative 1 would include construction noise from excavation, truck loading, and pile driving during night-time hours that require a variance from the City's noise ordinance and have the potential to result in sleep disturbance at nearby residences and the shelter, and significant impacts to the operations of KEXP recording studio. During the day, impacts to the operations of the KEXP recording studio, in particular during the first 6 months of activity, would also be significant. Other tenants in the Northwest Rooms (the Vera Project, SIFF Film Center, and the A/NT Gallery) would also notice day-time construction noise, but they would not experience significant impacts.

Vibrations generated by impact equipment could result in significant impacts to the operations of the KEXP recording studio, and potentially to SIFF Film Center and the Vera Project.

Alternative 2: Modified Proposal

Noise

Construction-related noise generated by Alternative 2 would be similar to those described for Alternative 1. The location of construction equipment used for Alternative 2 would be the same; however, Alternative 2 would result in a longer construction period since work hours would be limited to day-time, those allowed under SMC 25.08.425. Under Alternative 2, construction would take at least 6 additional months, and thus the types of day-time noise impacts described for Alternative 1 would be experienced for a longer duration, including exceedances of the noise standards of SMC 25.08.425 caused by pile drivers. This would be a significant impact to KEXP operations. Noise level would be less likely to result in a significant impact to SIFF Film Center or the Vera Project because they are farther away than KEXP from construction. However, as there would be no night-time work (except work

allowed inside the arena under SMC 25.08.425) under Alternative 2, there would be no night-time noise impacts.

Vibration

Construction vibration impacts for Alternative 2 would be no greater than those described for Alternative 1. However, as there would be no night-time work outside the arena under Alternative 2, there would be no night-time impacts. The locations and type of construction equipment used for Alternative 2 are anticipated to be the same as Alternative 1, although the duration of construction would be longer. Like Alternative 1, vibrations generated by pile driving could impact the Northwest Rooms and result in significant impacts to the building as well as operations of the KEXP recording studio, and potentially to SIFF Film Center and the Vera Project.

8.5.2 Operations Impacts

The magnitude of the potential noise and vibration impacts from the project during operations is classified as less-than-significant or significant. Significant impacts are defined as meeting the following threshold. Less-than-significant impacts fall below this threshold. Impact characterization is based on consistency with noise regulation criteria, which are based on potential annoyance and disturbance to receptors.

Noise

Criteria for Significant Noise Impacts: The anticipated exterior noise level is increased by more than 5 dBA over existing ambient noise levels when the ambient noise levels already exceed SMC 25.08.410(A) during the hosted events at the project site. The increase of traffic volumes during events would also be considered in this threshold.

Vibration

Vibration is primarily a construction-related issue. During project operations, vibration is anticipated to be similar to existing conditions and is therefore not analyzed further as part of the EIS.

No Action Alternative

The No Action Alternative would not increase noise levels over existing conditions, which range between approximately 63 and 69 dBA Leq for a 24-hour period (both on a day with and without an event based on recent monitoring [see Table 8-4]). Impacts would be less-than-significant.

Alternative 1: OVG Proposal

Project operations would increase the frequency of existing noise sources, both stationary and mobile, within the study area. Stationary noise sources would include the operation of public address systems and amplification equipment, not only inside the arena but also for occasional outdoor performances and events. Mobile noise sources would include increased traffic and crowd ingress and egress noise on local streets.

Noise

The project is within an existing arena and event center that is surrounded by a characteristically noisy urban environment where the existing noise level exceeds the current 60 dBA allowable limit for

commercial uses in SMC 25.08.410(A) as indicated by the results of the long-term measurements revealing between 63 and 69 dBA Leq for a 24-hour period (both on a day with and without an event).

Event-Related Noise

Amplified sound, either interior or exterior, would be required to be consistent with the noise ordinance. Comparison of noise monitoring data of hourly Leq during a concert event and a non-event indicated that only the 7:00 PM, 9:00 PM, and 11:00 PM hours reflected a measureable 1 dBA to 3 dBA Leq increase in noise levels during a concert event (see Table 8-5).

The project would generate exterior noise levels similar to existing conditions, and thus would not meaningfully add to the existing ambient noise levels in the study area. The project would be consistent with the restrictions of the noise ordinance. In addition, the anticipated exterior noise levels would not increase more than 5 dBA Leq over existing ambient noise levels when the ambient noise levels already exceed those specified in SMC 25.08.410(A). Event-related noise is anticipated to be a less-than-significant impact.

Frequency of Events

Operation of the project would increase the frequency of events. The existing arena hosts approximately 2 or 3 events per week on average. Upon completion, the Seattle Center Arena would host approximately 4 or 5 events per week, depending on season, introducing NHL and NBA games, in addition to continued concert events and WNBA games. Noise sources that currently exist (such as amplified sound, outdoor events, and plaza programs for both pre-and-post events) would occur more often. Exterior noise data indicate that the increase in noise levels during an event was minor and of short duration, often related to vehicular or foot traffic of the crowd upon arrival and exiting (see discussion under *Event-Related Noise*, above). In commercial districts, the allowable noise level can increase up to 70 dBA for up to 5 minutes within a given hour and 75 dBA Lmax for short durations within a given hour. Noise monitoring revealed that Lmax levels during the events ranged from 69.4 dBA Lmax to 86.8 dBA Lmax. Although the number of events would approximately double, the noise level within a single hour already exceeds the 75 dBA Lmax limit set by SMC 25.08.410(A). Therefore, the increase in frequency of events at the arena would be a less-than-significant impact.

Outdoor Plaza Events

Portions of the proposed outdoor plazas may be equipped with video screens and speakers during certain events. This could accommodate activities such as outdoor festivals up to 2 hours before doors open and 1 hour after event end; overflow crowds watching a sold-out game via boards and fan festivals in the plaza area outside the venue; pre-concert radio booth/small stage with local support band before larger indoor concert; and festivals that encompass inside and outside stages. Equipment for these events could operate prior to and/or after some games or events.

While most of these activities would attract ticketed attendees for the arena event, some have the potential to draw visitors in excess of the arena capacity, resulting in the need for and use of outdoor screens and sound amplification. However, these instances are expected to be infrequent, such as a local team participating in a playoff or championship game. The operator of the amplified equipment would be required to comply with SMC 25.08.520, which necessitates sound-control monitoring for amplified sound at public parks and places such as the Seattle Center. Because the frequency of such events would be low, and outdoor amplification currently occurs associated with events such as fun runs, outdoor concerts, and gatherings, this would be a less-than-significant impact.

Traffic-Related Noise

Alternative 1 would increase the number of events at KeyArena. Current event-related traffic is generated by approximately 102 events a year (2–3 a week); this would increase to about 240–260 annually (4 to 5 a week). Consequently, event-related traffic and its associated noise would not, by itself, increase with the proposed project, but rather the frequency of event-related traffic days would increase.

Event-related noise, including roadside traffic, in the study area is captured in the monitoring data presented in Table 8-5. The results of both the short-term and long-term noise measurements generally reflect existing noise conditions, which are noisy and influenced by typical activities surrounding mixed-use residential and commercial land uses in a downtown urban area. Table 8-5 indicates that while hourly average Leq noise levels during an event can be as much as 3 dBA greater than those during the same hour without the event, noise levels during most other hours were recorded to be similar to those without an event. Consequently, the increase in the number of events under Alternative 1 would result in additional hours per year where roadside noise levels would be increased but the magnitude of those increases would be at a level characterized as barely perceptible and would be a less-than-significant impact.

Construction Impacts Summary for Alternative 1

Based on the EIS analysis, operations noise impacts would be less-than-significant for event-related noise, outdoor plaza noise, and event-related traffic.

Alternative 2: Modified Proposal

Noise

Operations noise impacts for Alternative 2 would be the same as those described for Alternative 1.

8.6 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

8.6.1 Construction

Measures to Reduce Construction Noise

To address impacts related to the proposed construction activities outside of normal weekday hours, OVG would be required to obtain a Noise Variance from the City, which would require the applicant to submit a Noise Management and Mitigation Plan (NMMP) to be approved by SDCI. An NMMP must contain a description of the exterior sound level limits of the chapter of the code expected to be exceeded, estimates of the amount(s) by which these levels are expected to be exceeded and by what equipment, the exterior sound level limits that will be in effect during the variance, the time periods during which the pre-variance exterior sound level limits may be exceeded, and the expected sources of the sound during each of the time periods (e.g., types of equipment or activity causing the exterior sound level limits to be exceeded). Additionally, the NMMP must include measures and provisions to be taken to avoid exceeding the exterior sound level limits of the chapter of the code expected to be exceeded; provisions to mitigate sounds that exceed the exterior sound level limits and that cannot

otherwise be avoided; and a process for informing the public in the affected areas about the provisions of the variance.

For impacts caused by construction noise, the following mitigation measures could be considered to reduce the severity of impacts:

- Requiring stationary noise sources to be as far as possible (given physical site constraints) from adjacent receptors, including KEXP, the Vera Project, SIFF Film Center, among others and that they be muffled and enclosed within temporary sheds, incorporate insulation barriers, or use other measures to provide the greatest degree of reasonable noise reduction.
- Requiring that building owners and occupants of KEXP, the Vera Project, SIFF Film Center, and A/NT Gallery and others that could potentially be impacted by construction noise be notified prior to construction work that would generate noise exceeding the standards in SMC 25.08.425, and identify the best estimate of start and finish dates and hours of potential operation.
- Requiring that project-site-based diesel engines operating during night-time hours be equipped with exhaust and air-intake silencers designed for the maximum degree of silencing. The type of silencer required is that for use in critical noise problem locations such as high-density residential, hotel, and hospital areas.
- Require that project-site-based backup warning devices be the broadband type, or that the contractor use a backup observer as an alternative to backup warning devices as allowed by WAC 296-155-610(2)(e).
- Compression brakes should not be used on-site or for trucks entering or exiting the construction area, except for safety reasons.
- Evaluate the need for the short-term relocation of tenants or some of their activities and residents within close proximity of operation of impact equipment, excavation, and truck loading activities during the 6-month period that would include night-time construction.
- Work with the tenants of the Northwest Rooms to identify which areas of operation are most directly impacted by construction noise and consider offering methods of soundproofing that dampen the noise to acceptable levels to meet their operational needs.
- If noise impacts cannot be effectively mitigated, KEXP's recording studio operations may be temporarily relocated during construction.
- OVG would hire a full-time Community Liaison to coordinate with local community organizations during the construction phase to minimize noise and vibration-related impacts to the surrounding community.

Measures to Reduce Construction Vibration

The City may require the contractors to implement the following vibration control measures related to impact equipment and excavation activities:

Implement "quiet" pile installation techniques such as drill and cast-in-place methods and/or use of micropiles when pile installation is within 400 feet of KEXP, the Vera Project, SIFF Film Center, and A/NT Gallery if their operations are impacted by disturbances from impact equipment, in consideration of geotechnical and structural requirements and conditions.

When pile-driving cannot be avoided, install shrouds around the pile-driving hammer where possible.

Require that the contractors use non-vibratory excavator-mounted compaction wheels and small, smooth drum rollers for final compaction of any asphalt base and asphalt concrete. If needed to meet compaction requirements, smaller vibratory rollers will be used to minimize vibration levels during repaving activities where needed to meet vibration standards.

Prior to commencing impact equipment operations, require the contractor to notify building owners and occupants of KEXP, the Vera Project, SIFF Film Center, A/NT Gallery, and any building within a minimum of 600 feet of the project site of the dates, hours, and expected duration of such activities.

Coordinate with KEXP, the Vera Project, SIFF Film Center, and A/NT Gallery with respect to construction activities involving the use of pile drivers, bulldozers, drill rigs, and vibratory rollers within 400 feet of their operations to allow for operational adjustments to be made.

If vibration impacts cannot be effectively mitigated, KEXP's recording studio operations may be temporarily relocated during construction.

Structures sensitive to vibration may require stabilization during construction and/or repair after construction.

8.6.2 Operations

By complying with SMC noise regulations and deploying temporary noise mitigation measures during the noisiest concert events (e.g., a noise dampening curtain), noise impacts from operations of the arena would be reduced to levels that are less-than-significant.

8.7 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON NOISE

Significant unavoidable adverse impacts from noise may result, even after implementation of mitigation measures, due to the exceedance of the allowable noise levels in SMC 25.08.425. Night-time construction would require a noise variance from the City; however, the granting of a variance, although it requires implementation of an NMMP, would be unlikely to decrease the night-time construction sound to levels conducive to residential night-time use (e.g., sleeping) and would generally be disruptive to surrounding uses over the duration of the construction period. The extent of success of the NMMP in achieving night-time noise levels below sleep disturbance standards cannot be determined until its measures are clearly defined as part of the noise variance process. Additionally, significant impacts to KEXP and other tenants would result from noise and vibration from the use of impact equipment during the day.

9.0 VISUAL RESOURCES

This chapter describes the visual character surrounding the project site and the potential for the project to result in reduced visual quality, impacts to scenic views, and increased light and glare.

Key Findings for Visual Resources

Construction-related impacts on visual quality, scenic views, and light and glare would be less-than-significant due to the short duration of construction and use of a construction lighting plan.

Operational impacts on visual quality would be less-than-significant as long as the project is designed to meet City and neighborhood design guidelines.

Operational impacts on scenic views would be less-than-significant because the project would not obstruct or substantially change existing scenic views.

Operational impacts on light and glare are anticipated to be significant because the project would impair the safety of motorists.

No significant indirect or cumulative impacts on visual quality, scenic views, or light and glare are anticipated.

9.1 METHODS

This analysis includes potential impacts on: (1) visual quality, (2) scenic views, and (3) from light and glare.

Visual Quality

To assess impacts on visual quality, changes in the height, bulk, scale, and character of the project were reviewed for consistency with applicable plans, policies, and regulations identified in Section 9.2, *Regulatory Context*.

Scenic Views

Potential impacts on scenic views were evaluated through a review of the project design, Google Street View, and field observations.

Light and Glare

Impacts from increased light and glare were assessed qualitatively, comparing existing light and glare conditions with proposed light conditions (based on the increased use of light and lighted fixtures) and the potential for glare based on building materials. An analysis of shade and shadow is not warranted because the project would not create shade or shadow impacts on any existing public open space due to the solar orientation of the new open space and the small scale of structures that would be placed within the new open space. This is described in further detail in Section 9.4.2, *Operational Impacts.*

9.2 REGULATORY CONTEXT

The City has adopted SEPA policies and regulations for height, bulk, and scale (SMC 25.05.675.G); public view protection (SMC 25.05.675.P); and light and glare (SMC 25.05.675.K). Regulations related to aesthetics and light and glare are also codified within the Land Use Code (SMC Title 23).

A number of City plans and policies are intended to set an aesthetic standard for development within the City that aligns with City and neighborhood visions for the appearance of the built environment. The Seattle 2035 Comprehensive Plan (City of Seattle, 2016a) provides an overview of aesthetic values citywide; the Queen Anne (Uptown) Neighborhood Plan provides neighborhood-specific policies (City of

Seattle, 2016a); the Seattle Center Century 21 Master Plan (Century 21 Plan) outlines a 20-year vision for redevelopment at Seattle Center (Seattle Center, 2008); and the Century 21 Design Guidelines provide a set of guidelines specific to Seattle Center (Seattle Center, 2009). The City also has the Uptown Urban Design Framework, which describes the desired neighborhood character and urban form for Uptown, with the assumption that the Century 21 Plan would be implemented (City of Seattle, 2016b). There is also a green street concept plan for Thomas St (also called an Urban Village Neighborhood Access Street) (DPD and SDOT, 2013). The concept plan includes principles to complement existing neighborhood character and promote visual quality. Compliance with the plan is voluntary, and therefore consistency with this plan is not evaluated.

The Seattle Design Guidelines (City of Seattle, 2013a) and Uptown Neighborhood Design Guidelines (City of Seattle, 2013b) are used in by the Seattle Design Commission to review projects. The Seattle Design Commission reviews public projects and makes recommendations in the areas of urban design merit, street vacation, public access, open space planning, integration of public art, and streetscape design. The City is in the process of updating the Uptown Neighborhood Design Guidelines, which are expected to be submitted to the City Council in late summer or early 2019 (Carroll, 2018).

Height, bulk, and scale requirements for Seattle Mixed (SM-UP) zones are detailed in SMC 23.48.702. Height and bulk controls and other zoning regulations are used to protect scenic views; however, project-specific review is often required to adequately assess impacts to public scenic views identified in SMC 25.05.675.P. This includes public views of historic landmarks, which "contribute to the distinctive quality or identity of their neighborhood or the City." Specified view corridors are protected through setback requirements in the Land Use Code. Light and glare from land uses in the Seattle Mixed zone are regulated through SMC 23.47A.022. Light and glare from signs is regulated through SMC 23.55.016.

The existing KeyArena structure and rooftop signage exceed current zoning standards for height and standards for rooftop signage (but is a legally established non-conforming structure) (see Chapter 3, *Land Use*).

Key Terms and Concepts

Visual Quality is how well the overall visual character of an area or field of view meets viewer preferences. It is the aggregate of the visible attributes of a scene or object, including natural and built features. In urban settings, the visual character is influenced primarily by the land use type and density, urban landscaping and design, and topography. For this analysis, high visual quality is assigned to development that meets City regulations for height, bulk, and scale; transparency, setbacks, and landscaping; and neighborhood and City design guidelines and design review requirements.

Scenic Views - Views of Mount Rainier, the Cascade and Olympic mountain ranges, Puget Sound, Lake Washington, Lake Union, the Ship Canal, and the Downtown Skyline, including protected public viewpoints (as identified in the Seattle SEPA regulations), public views of landmarks, view corridors, and scenic routes.

Glare - Visual effect that results from a large contrast in luminance between a bright light source and dark background within a viewer's field of vision.

9.3 AFFECTED ENVIRONMENT

The affected environment is described according to the existing visual quality, scenic views, and light and glare.

9.3.1 Study Area

The study areas for visual quality, scenic views, and light and glare are shown on Figure 9-1.

Visual Quality

The visual quality study area is the 1 to 2 blocks surrounding the project site. This is based on the developed nature of the area, which restricts the sight distance for viewers in the immediate vicinity. Impacts to visual quality are most likely to occur where the site is most visible. However, all of the Seattle Center is included in the visual quality study area in recognition of the fact that there are plans and guidelines for consistent visual quality at the Seattle Center (Seattle Center, 2008, 2009). Although the renovated arena would be visible from areas outside of the study area, changes to height, bulk, and scale would not be visible (except for changes to the cupola, the structure at the top of the roof, and roof signage). Changes to the roof and the cupola are considered as part of the scenic views assessment.

Scenic Views

The largest study area is for scenic views, which is the area within one-half mile of the project site parcels. The arena is visible outside of this study area, but the potential for view change or alteration is low due to the relative scale of the project within the urban landscape, and the likelihood that views would be obscured by topography and existing development. The study area used to assess impacts on public views of landmarks is the same as the Historic and Cultural Resources assessment of aboveground resources (see Chapter 6). The scale of development would not result in view obstruction of landmarks outside of the project site, so this analysis focuses on changes to the landmarks themselves and potential impacts to public views.

Light and Glare

The study area for light and glare includes the streets and buildings adjacent to the project site. The project is located in an urban environment with existing light and glare, as well as buildings that limit the distance of light and glare impacts.

9.3.2 Existing Visual Quality, Scenic Views, and Light & Glare

This section describes existing conditions for visual quality, scenic views, and light and glare.

Visual Quality

KeyArena is a prominent structure on the west side of the Seattle Center campus in Uptown, a mixed-use area between residential development on Queen Anne hill to the north and larger scale development in Downtown Seattle to the south. The topography of the study area and project site slopes generally to the southwest, except for the eastern boundary of the site, where the topography slopes downhill to the north. Vegetation within the study area is primarily comprised of street trees and

Figure 9-1. Study Area for Visual Resources

urban landscaping (e.g., a variety of deciduous trees, grass, and flowering and non-flowering shrubs and bushes). Seattle Center is a prominent feature in the study area, and has its own unique built environment, hosting a variety of architectural styles, larger buildings than the immediate surroundings, and 40 acres of landscaped and green open space (City of Seattle, 2016a). This EIS analysis focuses on the visual character of the built environment within, and immediately adjacent to, the project site. Figure 9-2 illustrates the prominent structures in the surrounding built environment.

Scenic Views

The following section describes the scenic views from protected public viewpoints and scenic routes, public views of landmarks, and private scenic views.

Public Views

SMC 25.05.675.P identifies protected viewpoints within the City. It is City policy to protect public views of the Space Needle from a number of public places, including selected local parks. There is one protected public viewpoint within the scenic views study area from which the project would be perceptible: Kerry Park. Although Myrtle Edwards Park and Bhy Kracke Park are also in the study area, a field visit was conducted in November 2017 and it was determined that changes to the arena would not be visible from either of these locations due to topography and the density of development. As shown in Photo 9-1, Kerry Park provides scenic views of Seattle Center, Downtown, Elliott Bay, and West Seattle (see Photo 9-1).

Photo 9-1. View of KeyArena and Elliott Bay from Kerry Park

The project would also be visible from protected viewpoints outside of the study area. However, it is unlikely that views would be substantially altered due to the relative scale of the project within the urban landscape. In addition, the project would not be visible from many of the viewpoints due to topography, vegetation, or existing development.

Scenic Routes

City of Seattle Ordinances #97025 (Scenic Routes identified by the Seattle Engineering Department's Traffic Division) and #114057 (Scenic Routes identified as protected view rights-of-way by the Seattle Mayor's April 1987 Open Space Policies Recommendation) identify specific scenic routes throughout the city where protection of views is encouraged. Some streets around the arena are designated as scenic routes by the City for their territorial views of the city and surrounding mountains and water bodies; as well as views of structures within Seattle Center. The scenic routes with views of KeyArena are Mercer St, 2nd Ave N, Thomas St, and 1st Ave N (Figure 9-3).

Figure 9-2. Prominent structures within the Visual Quality Study Area

Note: Although the adopted scenic route designation covers the entire length of Broad St to its intersection with Aurora Ave N, the portion of Broad St north of Thomas St was permanently closed in 2014 to accommodate construction of the northern portal for the new SR 99 tunnel.

Figure 9-3. Scenic Views, Scenic Routes, and Landmarks Map

Landmarks

City policy protects public views of historic landmarks designated by the Landmarks Preservation Board (SMC 25.05.675.P). Four landmarks are evaluated in the landmark study area: KeyArena, Bressi Garage, the Northwest Rooms, and International Plaza. This assessment evaluates changes to Landmark-designated sites and building exteriors that would alter how the Landmark contributes to the distinctive quality or identity of the neighborhood or the City. Consistency with the Landmarks Preservation Ordinance is evaluated in Chapter 6, *Historic and Cultural Resources*.

Private Scenic Views

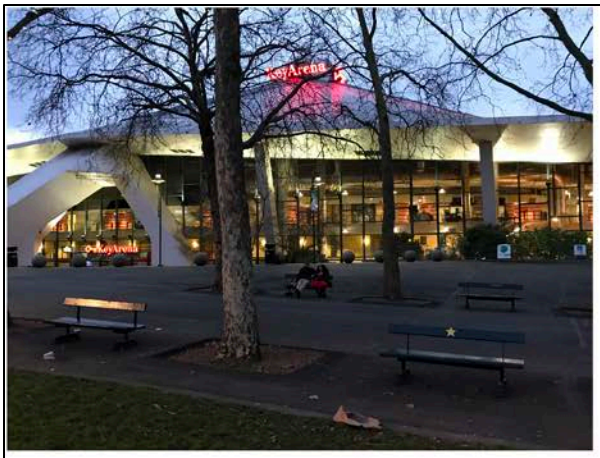
Mount Rainier, the Cascade and Olympic mountain ranges, Puget Sound, Lake Washington, Lake Union, the Ship Canal, and the Downtown skyline can be seen from private properties throughout the study area. However, the potential for impacts from the project is greatest where there are residential views of the Downtown skyline (i.e., from Queen Anne hill).

Light and Glare

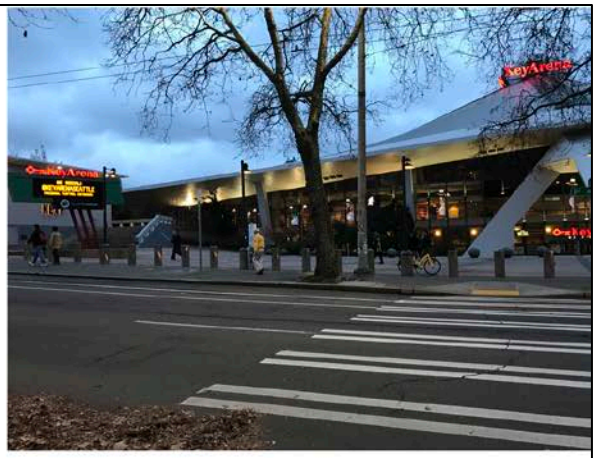
The project is in an urban area with many sources of night-time lighting. Due to the surrounding open space associated with the Seattle Center and the setback of the arena from the surrounding streets, areas of darkness are more prevalent than in other parts of Uptown. However, lighting levels along 1st Ave N are typical for the level of commercial and mixed-use development in the immediate vicinity. Street lights, building lights, vehicle headlights, signage, and security lighting are all present in the study area. The project site, as it exists today, includes the following light sources (some of which are shown in Figure 9-4):

- Lighted signs (KeyArena sign, the digital sign on 1st Ave N, etc.).
- Light fixtures under building overhangs.
- Light from the interior of KeyArena shining out the glass windows.
- Street lights.
- Pedestrian-scale lighting along sidewalks (1st Ave N) and pathways within the Seattle Center.
- Landscape lighting.
- Security lighting.

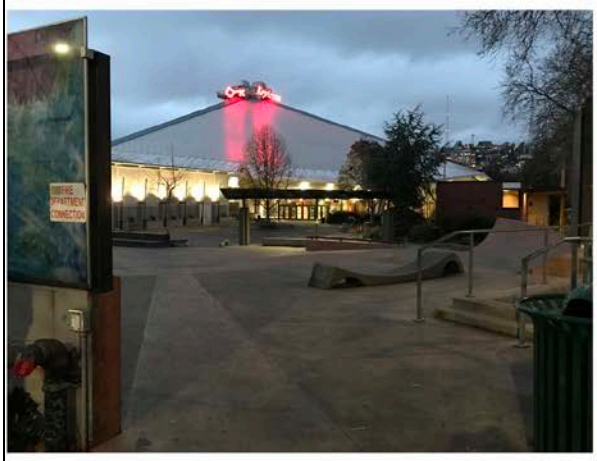
Glare occurs during daytime when sunlight is reflected from glass or metal surfaces. Sources of glare in the study area are largely from reflections from vehicles or building windows.



View from the Seattle Center looking west

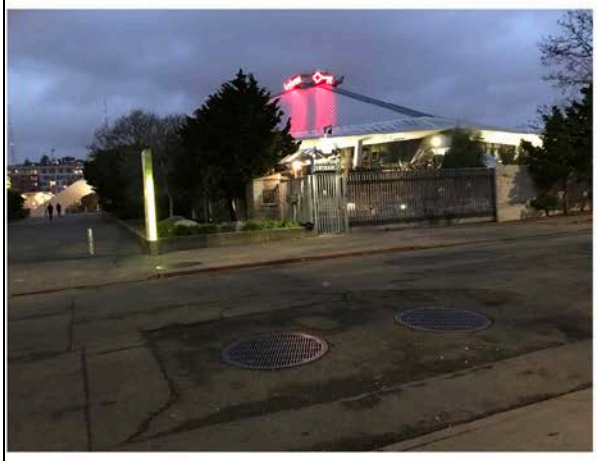


View from 1st Ave looking east

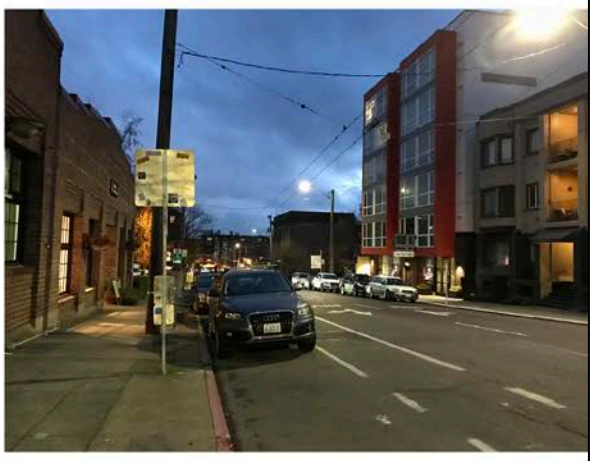


View from the Seattle Center Skatepark looking northwest

View from Thomas St looking north



View from Thomas St looking northeast



View from 1st Ave and Thomas St looking south

Note: These photos were taken at twilight (4:30 PM in mid-December) to show lighting conditions in the study area. Twilight is an ideal time to photograph light conditions because it is light enough for viewers to identify surrounding buildings, but dark enough that the light and glare impacts are fully shown.

Figure 9-4. Existing Light Conditions at KeyArena

9.4 POTENTIAL IMPACTS

Impacts can be short-term related to construction activities, or long-term related to the permanent structure and operation of the project.

9.4.1 Construction Impacts

Potential impacts on visual quality can result from construction staging and material storage; detours; fencing around the perimeter of the construction area; signage including wayfinding signs for vehicles, bicycles, and pedestrians; land use notices; construction company signage; scaffolding; temporary vegetation clearing; and the increased presence of construction vehicles, equipment, materials, and personnel. Overall, construction-related significant impacts to visual quality are not anticipated due to the limited geographic extent of impacts and their temporary nature.

The magnitude of the potential impacts on scenic views or light and glare as a result of construction would be characterized as significant as follows. Impacts that do not reach this threshold would be less-than-significant.

Criteria for Significant Construction Impacts: The impacts of construction activities would be significant if construction would largely block or obstruct a scenic view for more than 3 years, or if construction were to produce light and glare that would impair the safety of nearby motorists and pedestrians.

No Action Alternative

Under the No Action Alternative, there would be no changes to the arena, surrounding buildings, or the arena property. No significant impacts on visual quality, scenic views, or light and glare would occur.

Alternative 1: OVG Proposal

Scenic Views

Construction of the project is expected to take approximately 24 months. Construction activities visible from Kerry Park would be minimal and would be associated with installing a larger cupola and new sign on top of the arena. The majority of construction activities (e.g., demolition of existing structures, construction staging, etc.) would be visible from locations along 1st Ave N, 2nd Ave N, and Thomas St. Views from these scenic routes would be slightly altered for much of the construction period. As described in Section 9.2, *Regulatory Context*, public views of landmarks are protected as a scenic resource because they contribute to the distinctive quality and identity of the neighborhood and city. KeyArena, Bressi Garage, the Northwest Rooms, and International Plaza are designated Landmarks. Construction activities would likely obscure views of the Landmarks during active construction. It is possible that Bressi Garage may be deconstructed and rebuilt for construction of the loading dock access tunnel. Deconstruction of the Landmark would be a temporary but adverse impact to scenic views. In addition, the roof of the breezeway of the Northwest Rooms may need to be removed during construction, but it would be replaced once construction has ended. Impacts to designated Landmarks would be subject to the City's Certificate of Approval process. Bressi Garage and the Northwest Rooms would be restored to their original condition in less than 3 years. Due to the short duration of construction, impacts to scenic views would be less-than-significant.

Light and Glare

Night work outside of the arena would occur during the first 6 months of construction and periodically for the remainder of construction and would require lighting. Light from night work would be most noticeable to residents of Astro Apartments and the shelter at Sacred Heart Church, which face the project site. These residents would see lighting for demolition of the buildings south of KeyArena and excavation of the underground parking garage and loading dock. Tenants at the Northwest Rooms may see lighting from work in the plaza north of the arena. The lighted construction area would also be noticeable from Fisher Pavilion and 1st Ave N and Thomas St. Potential impacts would be reduced through the presence of trees and implementation of a construction lighting plan; these impacts would be less-than-significant. Lighted construction would be less visible north of the Northwest Rooms because the building itself would prevent spilling of artificial light from the project onto an adjacent property. Construction lighting would be implemented and shielded or directed (to the extent feasible) to avoid light trespass that could create light and glare issues for passing motorists and pedestrians.

With implementation of a construction lighting plan, impacts from increased light and glare would be less-than-significant.

Alternative 2: Modified Proposal

Construction impacts on visual quality, scenic views, and light and glare would be similar to those described for Alternative 1; however, there would be no night work and thus no impacts from night-time lighting. Also, construction would last at least 30 months, and impacts would occur over a longer period of time. Impacts would be less-than-significant due to their limited geographic extent and temporary nature.

9.4.2 Operations Impacts

The following defines long-term (operations) impacts on visual quality, scenic views, and light and glare. The project could have an impact if it caused a substantial disruption or change to the existing or future visual environment. The magnitude of the potential impacts would be classified as significant as defined below. Impacts that do not reach this threshold would be less-than-significant.

Criteria for Significant Operations Impacts: The project would have a significant impact if it were to result in a substantial decrease in visual quality, to the point that it would not align with the City and neighborhood visions for the visual environment as expressed through applicable plans, policies, and guidelines; were to substantially and permanently change a scenic view; or were to produce light and glare that would impair the safety of motorists and pedestrians.

No Action Alternative

Under the No Action Alternative, there would be no changes to the arena, surrounding buildings, or the arena property. No significant impacts on visual quality, scenic views, or light and glare would occur.

Alternative 1: OVG Proposal

Impacts associated with Alternative 1 are described in terms of impacts on visual quality, scenic views, and light and glare.

Visual Quality

Table 9-1 describes anticipated changes in visual character under Alternative 1.

Table 9-1. Changes to Visual Character Under Alternative 1

Changes to Height, Bulk, and Scale	• Wider cupola (more than 50% increase in size). • Larger roof sign (approximately triple in size; the maximum proposed area for each of the 4 roof signs is 700 square feet). • Digital sign on 1st Ave N replaced with a new, larger full-color digital reader board, with a different orientation to 1st Ave N. • NASA Building, West Court Building (existing box office), Blue Spruce Building, Seattle Center Pavilion, Restroom Pavilion, and skatepark demolished. • Addition of a glass atrium on south side of arena. • Addition of new Box Office (approximately 50 feet by 62 feet and 15 feet tall) and stair/mechanical buildings. • Building equipment (e.g., envelope cooling towers) added to the rooftop of 1st Ave N Garage. • Building equipment on the east portion of the Northwest Rooms may be replaced.
Changes to Transparency, Setbacks, Site Fixtures, and Landscaping	• Less obstructed views across site due to removal of buildings, existing gates, and loading dock equipment, and placement of new buildings more centrally within the site. • Additional on-site pedestrian sidewalks and open spaces along north side of Thomas St allow increased visibility. • New trees, low-level planting, and furnishings (e.g., seating and bicycle racks). • Trees removed on Thomas St, 1st Ave N, and the north plaza would be replaced according to mitigation requirements. • Grade of the south side of the site would be leveled, replacing the depressed grade of the current loading area with a flat plaza that is at-grade with street and the arena. • Elevations of west and east plaza would be restored to elevations more consistent with the arena as it existed in 1962. • Public artwork on the project site would be removed in accordance with SMC 3.14.840 (Deaccessioning and Disposition of Surplus Artworks). • Increased size and abundance of signs, banners, and light fixtures. • Increased brightness of video displays between dusk and 10:00 PM on non-event days or until 1 hour after evening events. • Security gates, railings, loading dock equipment, and security lighting in the service area south of the arena removed. • Other parking accessories in the south parcel surface parking removed.

The atrium lobby would be a departure from the existing visual character, by introducing a glass-walled structure with a more modern appearance. However, it has been designed to fit within the width of the existing façade. Overall, the bulk and scale of the project would be reduced because 5 structures and the

skatepark would be removed. The new box office and stair/mechanical buildings would be similar in height, bulk, and scale to the existing buildings on the south plaza. Under Alternative 1, the height of the arena would be unchanged.

Alternative 1 would result in views across the site being more open and less obstructed because buildings adjacent to the lot line, existing gates, and loading dock equipment would be removed, and new buildings would be constructed more centrally within the site. In addition, the grade on the south side of the site would be leveled to provide a flat plaza that is at-grade with the street and the arena, retaining open views across that portion of the site. More public open space would be provided as a result of the project, and it would include landscaping and urban design features that meet City and neighborhood design guidelines.

An increase in the number and size of allowable signs, banners, strings of pennants, and lights could lead to additional visual clutter.

Overall, the visual quality of the project site would change as a result of the project. Some would find the modernized appearance of the site to be more aesthetically pleasing than others. It is not anticipated that there would be a substantial decrease in visual quality to the point that the project would not align with the City and neighborhood visions for the visual environment. Therefore, impacts to visual quality would be less-than-significant.

Scenic Views

Most of the changes to the project site would not be visible from the protected view at Kerry Park. Changes to the roof (i.e., the larger and brighter sign, larger cupola on top of the arena, and accent lighting on the roof) are not expected to significantly impact views of Downtown because they would not obstruct or hinder views from Kerry Park. In addition, construction of a larger sign would not result in a long-term perceptible change to the view of the arena from Kerry Park. Impacts to private views from residences on Queen Anne hill would likely be similar to those from Kerry Park, except the arena may be more centrally located within some residential views.

Public views from scenic routes could be improved from Thomas St, 1st Ave N, and 2nd Ave N, with removal of buildings, gates, and equipment on the south side of the arena and new structures being placed away from the lot line, allowing for more open views of Seattle Center. The larger and brighter digital sign on 1st Ave N would change the views of the arena from 1st Ave N; however, it would not result in significant scenic view obstruction or alteration because it is an enlargement of an existing sign and would be closer to the street. The new sign is not expected to detract from the arena to the degree that it would substantially alter the existing scenic view.

Impacts to scenic views of designated Landmarks would occur. However, they are only considered significant if they would result in a Landmark no longer contributing to the distinctive quality and identity of the neighborhood and city (see Section 9.2, *Regulatory Context*). The proposed accent lighting along the roof would change the visual character of the roofline (a designated feature of the Landmark). However, the lighting would not substantially change views of the arena because the symmetry of the roof would be the same and the lighting would not make the roof unrecognizable from existing conditions. The new atrium lobby would change the south façade of the arena building, but would preserve the view of Landmark-designated pylon and V-shaped support columns. The south façade including the curtain wall (the curtain wall is a Landmark-designated feature) would be removed for the new atrium lobby. However, this would not alter the integrity of the structure to the point that it could no longer convey its historical significance.

Changes would also be made to the International Plaza north of the existing arena. Changes include removal and replacement of the existing hardscape, art, lighting, and 2 legacy trees, and permanent installation of an overlook and ADA ramp. As a result, the appearance of the plaza would substantially change. However, the plaza does not currently contribute to the distinctive quality and identity of the neighborhood and city due to its limited visibility; therefore, impacts would be less-than-significant.

Under Alternative 1, the exterior of the Bressi Garage building would be preserved or restored following construction. Removal of the kiln shed would increase visibility of the Bressi Garage Landmark. Adverse impacts to Bressi Garage are not anticipated.

No significant impacts to scenic views would occur.

Light and Glare

The project would add new night-time lighting on the project site, increasing the illumination levels of the existing setting. Some of the proposed lighting features are as follows (see Figure 9-5):

- An internally illuminated sign surrounding the cupola (approximately 16 feet high by 43 feet wide) that could change color for different events.
- A new digital reader board next to 1st Ave N with integrated illuminated arena name and video capability (approximately 15 feet high by 20 feet wide, or 300 square feet), with a different orientation to 1st Ave N than the existing 50 square foot digital display.
- Accent lighting on the roof (approximately 3 feet wide by 183 feet long).
- Digital signage would be displayed on the exterior of the atrium lobby and visible through the glass.

Accent lighting would be added to the arena building, illuminated signs would be placed above entry doors with static messages, and light pole banners (approximately 30 feet high by 1.5 feet wide), pedestrian direction pylons (approximately 2.5 feet high by 8 feet wide), and digital reader boards (approximately 25 feet high by 6 feet wide) would be placed throughout the site (see the Seattle Arena Exterior Sign Proposal in Appendix G).

If the increased use of digital reader boards were to occur, the appearance of the arena would change; it would have more lighting and dynamic signs and would become a focal point within the visual environment, contrasting with surrounding development. Because the existing arena is a unique land use, there is already a high degree of contrast in the lighting and signage. However, the collective effect of these proposed changes would be to sharpen the contrast even more.

Figure 9-6 is a rendering of what the renovated arena might look like from Fisher Pavilion with a digital reader board in the foreground and digital atrium signage. City sign regulations (SMC 23.55) currently limit the number, size, type, illumination, video display, commercial content, and other characteristics of signs associated with the arena. OVG would need to apply for a variance or code amendment to allow for the lighted signs as proposed (see Appendix G).

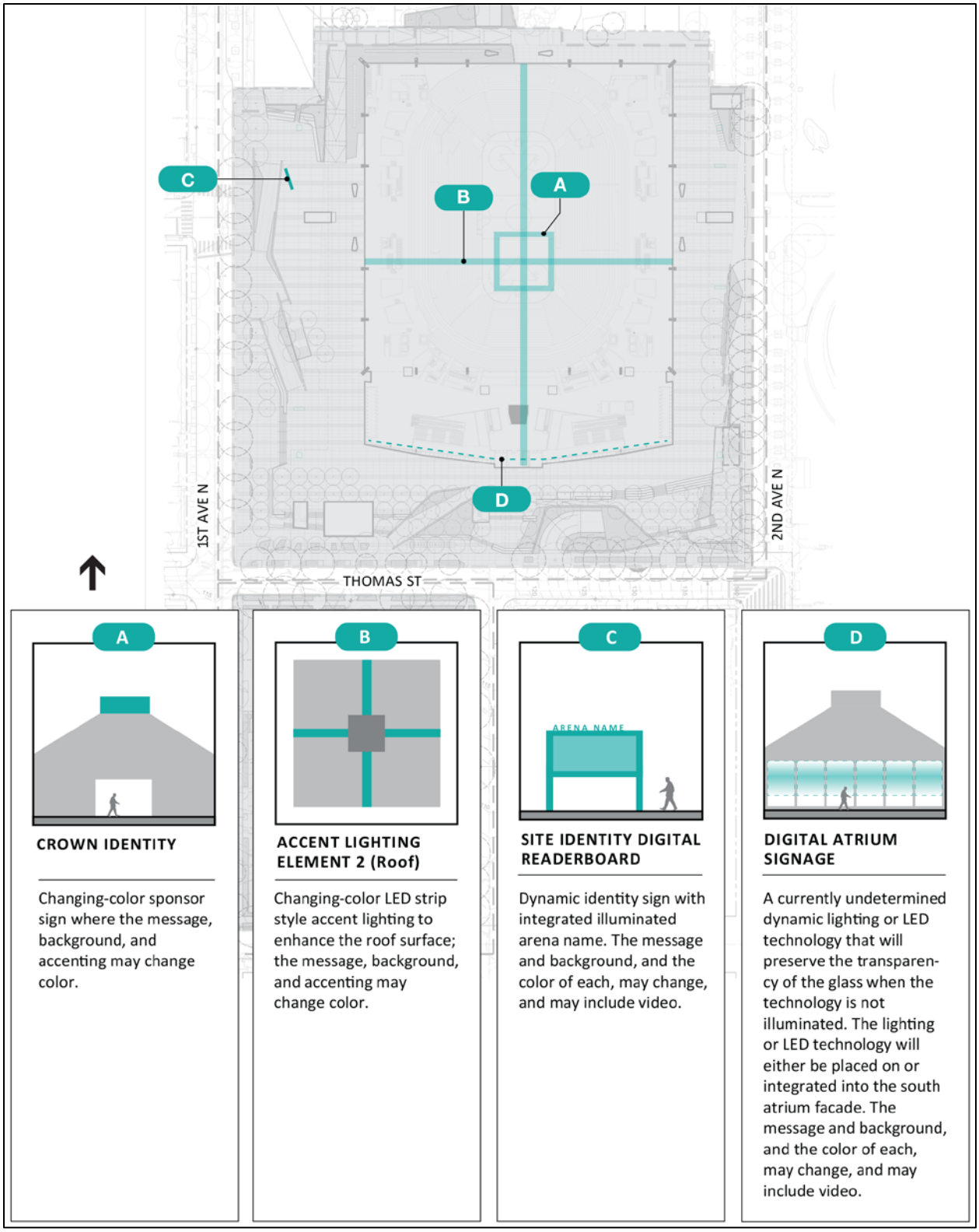


Figure 9-5. Highlights of Proposed Signage with Light and Glare Impacts

Figure 9-6. Potential Signage and Lighting Conditions

Between dusk and dawn, the brightness of signage is proposed to be up to 5,000 nits, which is substantially brighter than night-time ambient light levels and is brighter than the 500 nit brightness limit established in SMC 23.55.005A.10. The International SignAssociation's (ISA's) *Recommended Brightness Levels for On-Premise Electronic Message Centers (EMCs)* states that "EMC's [should] not exceed 0.3 footcandles over ambient lighting conditions when measured at the recommended distance based on the EMC size" (ISA, 2010). While not adopted as a guideline or requirement in Washington, this guidance has been integrated into regulations (in various forms) in Arizona, Colorado, Massachusetts, Michigan, Missouri, New Mexico, Oregon, Puerto Rico, Tennessee, West Virginia, and Wyoming (Klein, 2015). For context, according to the ISA recommendations, the proposed 300 square foot 1st Ave N sign should not exceed 0.3 footcandles over ambient lighting conditions at 173 feet from the sign. At 5,000 nits, the sign would substantially exceed this brightness level during night-time hours if the sign is not dimmed. Such brightly lit signs could impair driver safety at night due to increased contrast between the sign and the darker surrounding ambient light conditions, making it difficult for drivers at distances approximately 175 feet from the sign to see darker objects, including pedestrians.

What is a nit?

A metric unit of luminance, defined as candela (luminous intensity) per square meter (cd/m2). A common candle emits light with roughly 1 candela luminous intensity. Nits quantify surface brightness, or the amount of light an object gives off.

Outdoor Advertising Association of America recommendations for digital billboard illuminance = 300–350 nits.

The Illuminating Engineering Society of North America (IESNA) recommendations for digital billboard illuminance = 250 nits (day), 125 nits (night). [Source: Young, 2010]

In Seattle, SMC 23.55.005A.10 states: "between dusk and dawn the video display shall be limited in brightness to no more than 500 units." Because units are not defined in the code, for the purposes of this EIS we assume that the units are nits.

OVG is proposing to use video displays between 7 AM and 10 PM on non-event days. For events, video displays could be used until 1 hour after the event regardless of the time of day. The video displays proposed by OVG would be visible from neighboring streets and properties, and would display messages up to 20 seconds in length before there is a still or blank image. Proposed video displays on the atrium may be up to 30 feet above the ground, comprising the entirety of the atrium wall. The video display on the new 1st Ave N digital reader board would be closer to the street and would be 5 times larger than the existing digital display portion of the sign.

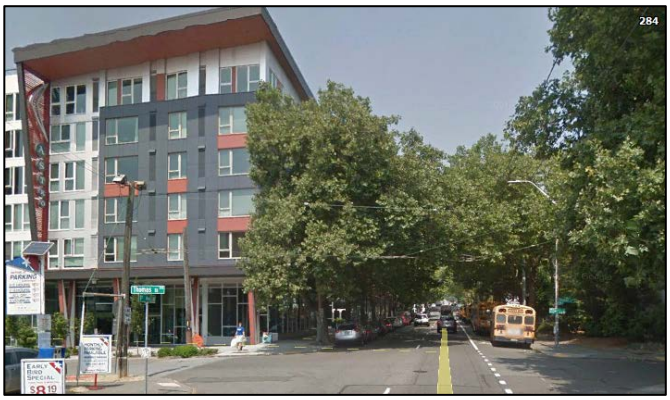
Under SMC 23.55.005A.7, the maximum duration of a video display message is 5 seconds. However, due to the proximity of the 1st Ave N sign to the street, such a duration would still likely increase driver distraction. Studies have shown that drivers look at digital billboards significantly longer than other signs, with the digital signs often taking a driver's eyes off the road for more than 2 seconds (Dukic et al., 2012). Anything that takes a driver's eyes off the road for more than 2 seconds increases the risk of a crash, with nearly 80% of all crashes involving driver inattention just prior to (within 3 seconds) of the crash (Virginia Tech, 2006). The use of video displays and digital images so close to 1st Ave N has the potential to impair driver safety through distraction.

The east and north sides of the arena face internally toward other uses in the Seattle Center and would not adversely affect those adjacent uses. The west side of the arena faces residential and commercial uses and an arterial street, and the south side faces a church. In these areas, the general public and these adjacent uses could be adversely affected by brightly lit signs and video displays that would operate throughout the day and into the night for most nights of the year. Brightly lit signs, especially ones with dynamic displays that change in light intensity, could affect interior light levels in adjacent buildings, possibly affecting sleep and general enjoyment for occupants of those buildings, and could distract drivers on streets with heavy vehicle and pedestrian traffic. With frequent changes in color, light intensity, and motion, the 1st Ave N digital reader board could be distracting to drivers on 1st Ave N and could negatively impact residents immediately west of the sign. The brightness and visual distraction introduced by the digital signs proposed for the project have the potential to produce light and glare that would impair the safety of motorists and pedestrians, and therefore significant impacts could occur. This could be minimized through the use of a static image on the 1st Ave N sign and placing restrictions on the length and type of video display allowed for the other proposed signage.

The brighter roof sign would not result in significant adverse impacts due to its placement in a developed setting with taller, lighted buildings in the background.

The project would introduce a new source of glare (the glass atrium lobby), which has the potential to result in glare impacts. Due to the orientation of the sun and angle of the windows, vertical windows on the south sides of buildings cannot cast sun glare far from the building. Similarly, vertical windows on the east and west sides of buildings have limited capability to cast glare. However, if a building window is angled, it could cast reflections of the sun horizontally for large distances or even upward into the sky. Glare from sunlight reflected from east-facing or west-facing windows and metallic materials would be limited, occurring only when the sun is very low in the sky, primarily in the first half hour after sunrise or the last half hour before sunset. Glare in the early morning would be directed eastward and downward, toward the Fisher Pavilion. Glare just before sunset would be directed westward and downward, toward the development south of Thomas St and west of 1st Ave N. Due to the angle of the atrium lobby surface facing south, surrounding streets and open space areas would not experience significant glare impacts. Although glare may be visible to drivers on 1st Ave N, it would likely be off-axis and not bright enough to distract attention or impair vision. The greatest potential for glare impacts would be to the Astro Apartments due to its location to the west of the new arena and because it is a taller building. The

shelter at Sacred Heart is not expected to be impacted because it is located to the south and is a single-story building. Glare impacts could occur in summer during the late morning when the sun is high above the horizon and east of the atrium lobby. However, glare impacts would likely be reduced by the presence of trees, which would have their leaves during the summer months when this high sun angle would occur (see Photo 9-2).



Source: Google Earth, 2018

Photo 9-2. View of Astro Apartments from 1st Ave N looking North

Due to the topography of the site and the lack of taller buildings that would be exposed to glare, no significant glare impacts would occur. In addition, trees would reduce light and glare impacts and would be included on all sides of the structure facing streets.

No significant impacts from shadows on open spaces are expected. Existing structures would be removed and replaced with smaller structures (e.g., the new box office) on the south portion of the plaza. In addition, the atrium lobby, which would be the largest new structure, would be made of glass and would not produce shadows onto the plaza.

Indirect Impacts

No indirect impacts would occur as a result of the project.

<u>Alternative 2: Modified Proposal</u>

Impacts from Alternative 2 would be similar to Alternative 1, except that the new sign on 1st Ave N and roof sign would be similar to existing conditions. Alternative 2 would have signage similar to existing conditions. No variance would be required for the signage. In addition, the legacy trees would remain, preserving the existing views of those trees. Thomas St between Warren Ave N and 1st Ave N would be designed as a woonerf, and the aesthetics of the road would differ from Alternative 1. However, these changes would be consistent with design guidelines. These changes would result in fewer adverse visual impacts than Alternative 1.

9.5 CONSISTENCY WITH PLANS AND POLICIES

This section analyzes pertinent plans, policies, and regulations that guide or inform the Seattle Arena Renovation Project. These include the City's Comprehensive Plan; the Queen Anne (Uptown) Neighborhood Plan, the Seattle Center Century 21 Master Plan, Century 21 Design Guidelines, the Uptown Neighborhood Design Guidelines, and the City-adopted SEPA policies and regulations for height, bulk, and scale, public view protection, and light and glare.

The alternatives were reviewed for consistency with each of these plans and policies. The new atrium lobby, the new box office, and the new stair/mechanical buildings would conform to zoning requirements for height, maximum structure width and depth, and floor area ratio. The existing

KeyArena exceeds current zoning standards for height (see Chapter 3, *Land Use*). This would continue to be the case under the No Action Alternative, Alternative 1, and Alternative 2.

Under Alternative 1, there is the potential for inconsistency with the Uptown Design Guidelines, which state that "throughout Uptown tasteful signs designed for pedestrians (as opposed to passing vehicles) are preferred. Backlit signs, animated reader boards and similar signs are discouraged. Blade signs, wall-mounted signs, signs below awnings, and similar signs are preferred." Design guidelines would be considered by the Design Commission during review of the project. The Uptown Neighborhood Design Guidelines are being updated to incorporate consideration of contemporary design approaches, and this may translate into revised guidelines regarding reader boards and signage. However, the project would be inconsistent with the City Sign Code. City sign regulations (SMC 23.55) currently limit the number, size, type, illumination, video display, commercial content, and other characteristics of signs associated with the arena. Under Alternative 1, the project includes a request to modify or eliminate many of the restrictions of the sign regulations as they apply to this project (see Appendix G, Table G-1). OVG would need to undergo a variance process (for either a Sign Code variance or a Landmark structure exemption) or receive City Council approval on amendments to the Sign Code. Mitigation of adverse impacts would be part of the decision-making process. The proposed signage may be inconsistent with the Century 21 Design Guidelines. The guidelines include "key and fundamental tenets for integrating electronic technology and a digital media network into the Seattle Center campus," including restrictions barring light-emitting diode (LED) displays from internal portions of the campus, size and color limitations for reader boards associated with a single campus facility, and signage design that is consistent campus-wide. Additionally, the Century 21 Design Guidelines state that proposed updates or changes to the campus perimeter digital reader boards "comply with the Seattle Sign Code, be sensitive to and minimize any impacts on neighbors, and be mindful of a spare and uncluttered design aesthetic for perimeter streets that surround Seattle Center" (Seattle Center, 2009).

Under the Land Use Code, glare diagrams that identify potential adverse glare impacts on residential zones and on arterials are required when a proposed structure has a façade of reflective coated glass or other highly reflective material, and the structure is less than 200 feet from a residential zone or is 400 feet from an arterial with more than 15,000 vehicle trips per day. This does not apply to the project because it is not within 200 feet of a residential zone or 400 feet from an arterial with more than 15,000 vehicle trips per day. However, once the design is refined, further glare analysis may be conducted to better quantify adverse impacts from glare. Adverse impacts could be reduced through design changes to the angles of the building and use of glare-resistant materials.

9.6 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

9.6.1 Construction

The following measures are recommended to mitigate impacts to visual resources:

Visual Quality

- To reduce impacts on visual quality from construction staging and material storage, staging areas would be restored as quickly as possible following project completion.

- To reduce impacts on visual quality from temporary vegetation clearing, vegetation removed for construction activities would be replanted.

Scenic Views

- To reduce impacts on scenic views, the timeframe that construction activities would obscure public views (e.g., deconstruction of Bressi Garage or construction on the roof of the arena) could be reduced to the extent practicable.

Light and Glare

- To address light and glare impacts associated with night-time construction:
    - A construction lighting plan would be created and implemented.
    - Construction contractors would ensure all lighting related to construction activities is shielded or directed to restrict direct illumination onto properties located outside of the project site.
    - Fugitive light from portable sources used for construction would be minimized.
    - Night-time exterior construction work would be limited as much as possible.

With the integration of the mitigation measures above, no significant adverse impacts are anticipated.

9.6.2 Operations

As part of the design and approval process for the project, visual impacts will be considered by the Landmarks Review Board, the Seattle Design Commission, and Seattle Center. This includes evaluating consistency of the project with area plans, policies, and design guidelines and reviewing any changes to scenic views of designated Landmarks. To limit visual impacts, the following mitigation measures should be considered:

Visual Quality

- To mitigate impacts associated with removal of existing artwork, OVG could install new public art as part of the proposed project.

Scenic Views

- To lessen impacts associated with changes to views of the Bressi Garage façade, alterations to the Bressi Garage exterior should be minimized to the greatest extent practicable.

Light and Glare

The following mitigation measures are based on design guidelines and code requirements for lighting and video display.

- To reduce light and glare impacts from the 1st Ave N sign, digital displays signs could display static images only (i.e., restriction for any type of sign that contains images, text, parts, or illumination that flash, change, move, blink, or otherwise refresh in whole or in part). It is suggested that static images would change after an agreed-upon safe duration.

- To reduce potential safety impacts to drivers associated with light and glare from new digital signage, it is suggested that the signs could be limited to no brighter than ambient lighting conditions, in accordance with ISA recommendations.
- To mitigate light and glare impacts from digital displays, light levels emitted could be adjusted to respond to ambient conditions, and thereby avoid excessive brightness. The transition from day to night-time brightness could occur gradually, to prevent a sudden change in perceptible brightness levels by pedestrians and motorists**.**
- To reduce impacts associated with other additional lighting fixtures and signage at the project site, an operational lighting plan that complies with City Code should be developed.
- To mitigate glare from new signage, it is suggested that digital displays could be restricted from having large areas of reflective elements.
- To mitigate the potential for spillover light from new exterior lighting, new fixtures and light sources could be designed to focus light on-site.
- To limit impacts to dark sky, fixtures could be LED and shielded.
- To limit glare to pedestrians and adjacent properties, trees along Thomas St and 1st Ave N could be planted and retained to reduce direct sunlight falling on the south- and west-facing façades of new structures.
- To reduce glare to the street and neighboring buildings, cladding material and geometry for all new structures could be designed to reduce impacts.

9.7 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON VISUAL QUALITY, PUBLIC VIEWS, AND LIGHT AND GLARE

There would be no significant unavoidable impacts on visual quality and scenic views from either of the action alternatives. There would be significant adverse impacts on light and glare under Alternative 1; however, these impacts could be avoided through restrictions on luminance and the frequency and length of video display.

10.0 AIR QUALITY AND GHG EMISSIONS

This chapter analyzes quantitatively how the project alternatives may increase air pollutant emissions or contribute to global climate change through greenhouse gas (GHG) emissions related to increases in transportation and energy demand. Transportation systems contribute to air quality reduction primarily through the emissions of ozone precursors and particulate matter. Transportation systems contribute to climate change primarily through the emissions of certain GHGs (carbon dioxide [CO_2], methane [CH_4], and nitrous oxide [N_2O]) from nonrenewable energy (primarily gasoline and diesel fuels) used to operate passenger, commercial, and transit vehicles. Land use changes contribute to climate change through construction and operational use of electricity and natural gas, water demand, and waste production.

GHG emissions, as they contribute to climate change, are of a global concern, while criteria air pollutants are a regional concern. Consequently, the air quality and GHG study area generally consists of the proposed arena renovation area but also considers the indirect increase in vehicle miles travelled throughout the Puget Sound region resulting from the project.

Key Findings for Air Quality and GHG

Construction would generate temporary emissions of criteria air pollutants, but they would be below federal thresholds for CO and PM10.

Temporary GHG emissions from construction would be less than the level that Ecology recognizes as a significant impact.

Operational air pollutant emissions would be below the federal thresholds for CO and PM10 in 2020 and decline further by 2035.

Operational GHG emissions would initially reach approximately 28,200 metric tons per year, of which emissions from vehicles constitute over 99%. Emissions would decline annually to approximately 23,800 metric tons per year by 2035.

10.1 METHODS

The EIS Consultant Team reviewed the following sources of information on air quality and GHG emissions and local climate action efforts:

- Washington State Greenhouse Gas Emissions Inventory 2010–2013 (Ecology, 2016).
- U.S. Environmental Protection Agency (EPA), MOtor Vehicle Emissions Simulator (MOVES) (version 2014a) (EPA, 2014).
- NONROAD 2008 Model (version 2014b) (EPA, 2014).
- Our Nation's Air (EPA, 2017).
- U.S. Council on Environmental Quality (CEQ) Final Guidance for Greenhouse Gas Emissions and Climate Change Impacts (CEQ, 2016; withdrawn 2017).
- King County Strategic Climate Action Plan (King County, 2015).
- City of Seattle Comprehensive Plan 2035 (City of Seattle, 2016a).
- City of Seattle Climate Action Plan (2013 CAP) (City of Seattle, 2013).
- City of Seattle Greenhouse Gas Ordinance 122574 (2007).

- Puget Sound Clean Air Agency (PSCAA) Air Quality Data Summary (PSCA, 2017).
- California Emissions Estimator Model (CalEEMod) (California Air Pollution Control Officers Association [CAPCOA], 2017).

The City developed a GHG worksheet in 2007 to calculate GHG emissions; however, this worksheet was developed for general land use development projects and contains older emission factors and therefore was not suited for estimating emissions from an arena renovation project. Consequently, the above sources were used to develop project-specific emission estimates.

10.1.1 Analysis of Construction Impacts

Short-term construction activities generate temporary emissions from the use of heavy-duty construction equipment, vehicle trips hauling materials, and construction workers traveling to and from the project site. The assessment of construction-related air quality impacts considers each of these sources and recognizes that construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation, and (for dust) the prevailing weather conditions. Fugitive dust emissions were estimated using EPA's AP-42 Chapter 13.2.4 methodology for fugitive emissions from loading, road dust, and dumping of demolition and excavation material (EPA, 2006).

The City has a worksheet for GHG analysis that applies to common types of construction. The project is both an atypical use and an existing building that would be renovated, conditions that are not addressed in the worksheet. Therefore, the worksheet was not used. The Washington State Department of Ecology (Ecology) previously identified resources for methods and protocols for calculating and evaluating GHG emissions for SEPA analyses. There are no other Seattle or Washington State-specific guidelines for GHG emission analysis under SEPA, but the Ecology website refers to a methodology published by the Bay Area Air Quality Management District (BAAQMD, 2017). (In 2016, Ecology withdrew its "Guidance for Ecology Including Greenhouse Gas Emissions in SEPA Reviews.") The BAAQMD methodology was generally applied in determining GHG sources to be considered for this EIS analysis, because it addresses construction-related GHG emissions similar to those expected by the arena renovation project.

The anticipated project-specific schedule and CalEEMod default off-road equipment assumptions were used to determine emissions. CalEEMod is a land-use emissions model used in California that includes default construction equipment based on the size of construction project as determined from surveys of construction sites. Emissions factors for off-road equipment were determined using EPA's NONROAD model, specific to King County.

Emissions factors generated by the EPA MOVES model (version 2014a) were used in conjunction with estimated truck trip data for excavation activities provided by OVG to calculate construction-related on-road emissions. The EPA NONROAD model was used in conjunction with construction equipment estimates from the CalEEMod model to calculate construction-related emissions associated with the action alternatives. For construction, worker, vendor, and hauling vehicle class emission factors were determined, and CalEEMod default estimates for the number of trips and trip lengths were used to determine vehicle miles traveled, with an exception for hauling trips; hauling trips during excavation are estimated to be 290 trips per day for the anticipated 6 months of excavation.

Emissions were calculated for every year in which an action alternative is under construction using off-road and on-road emissions factors. The total sum of construction emissions for a given year was then compared to the federal general conformity *de minimis* thresholds applicable in King County for air quality. For GHG, Ecology retracted its prior guidance regarding significant impacts, and therefore there

is currently no threshold established for GHG emissions for SEPA or other regulatory compliance. For reference, GHG impacts are compared to thresholds for reporting GHGs.

10.1.2 Analysis of Operations Impacts

Long-term air and GHG emission impacts would be associated with the operation of the renovated arena and mobile sources associated with changes in permanent use of the project site. Long-term emissions are primarily mobile source emissions from an increase in vehicle trips associated with the project.

Any new stationary sources (such as natural gas heaters or backup generators) and uses would also result in pollutant emissions. Emissions factors generated by the MOVES model were used to estimate operational emissions, adjusted to match estimates of alternative-specific vehicle miles travelled (VMT) developed for Section 4.4, *Transportation*. The MOVES model run included model defaults appropriate for the area such as vehicle age distribution, average speed distribution, fuel supply, fuel formulations, fuel usage fractions, alternative vehicle and fuel technology, meteorology, and road type distribution. The total sum of operational emissions for the build-out year was then compared to the federal general conformity *de minimis* thresholds applicable in King County for air quality. As noted above, for GHG, Ecology retracted its prior guidance regarding significant impacts, and therefore there is currently no threshold established for GHG emissions for SEPA. For reference, GHG impacts are compared to thresholds for reporting to Ecology (WAC 173-441).

10.2 REGULATORY CONTEXT

The following briefly describes the regulatory setting for both air quality and GHG emissions relative to the proposed project. Please see Appendix H for a more detailed discussion of the regulatory setting.

10.2.1 Air Quality Regulations

Air quality in the Puget Sound region is regulated and enforced by federal, state, and local agencies—the EPA, Ecology, and the PSCAA; each has its own role in regulating air quality.

Pollutants of Concern

The main criteria pollutants of interest for project construction are carbon monoxide (CO), particulate matter (PM), ozone precursors, volatile organic compounds (VOCs), and nitrogen oxides (NOx). Both federal and state standards regulate these pollutants.

CO is an odorless, colorless gas usually formed as the result of the incomplete combustion of fuels. The single largest source of CO is motor vehicles. The federal CO standards have not been exceeded in the Puget Sound area for the past 20 years (PSCAA, 2011). However, the Puget Sound region continues to be designated as a maintenance area for CO until EPA changes this designation.

PM is measured in 2 size ranges: PM10 and PM2.5. Fine particles are emitted directly from a variety of sources, including wood burning, vehicles, and industry. The federal annual PM2.5 standard has not been exceeded in the Puget Sound area since monitoring began. All 4 counties in Puget Sound have been below the daily and annual PM10 federal standards from the early 1990s until monitoring was ceased in 2006 (PSCAA, 2008). However, the Puget Sound region continues to be designated as a maintenance area for PM10 until EPA changes this designation.

Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving VOCs and NOx. The main sources of VOC and NOx, often referred to as ozone precursors, are combustion processes (including motor vehicle engines) and the evaporation of solvents, paints, and fuels. The Puget Sound region is designated as an attainment area for the federal ozone standard.

Environmental Protection Agency

EPA has identified 6 criteria air pollutants that are pervasive in urban environments and for which state and federal health-based ambient air quality standards have been established: Ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. Additionally, subsets of PM have been identified for which permissible levels have been established; these include PM_{10} (matter that is less than or equal to 10 microns in diameter) and $PM_{2.5}$ (matter that is less than or equal to 2.5 microns in diameter). See Table H-1 in Appendix H for details.

The Clean Air Act established National Ambient Air Quality Standards (NAAQS) to protect the public health and welfare from air pollution, which are also specified in Appendix H.

The Puget Sound region is currently classified as a maintenance area for the CO and PM_{10} NAAQS, which indicates that EPA requires that these pollutants be considered in environmental analysis. These designations are used in assessing significance with respect to emissions of criteria air pollutants.

Washington State Department of Ecology

Ecology maintains an air quality program with a goal of safeguarding public health and the environment by preventing and reducing air pollution. Ecology strives to improve air quality throughout the state by overseeing the development of and conformity with the State Implementation Plan (40 CFR Part 52.2470(e)), which is the state's plan for meeting and maintaining NAAQS. Ecology has maintained its own air quality standard for 1-hour ozone concentrations and established its own more stringent air quality standards for annual NO_2, SO_2, and PM concentrations.

Puget Sound Clean Air Agency

PSCAA has local authority for setting regulations and permitting of stationary air pollutant sources and construction emissions. PSCAA also maintains and operates a network of ambient air quality monitoring stations throughout its jurisdiction.

10.2.2 Greenhouse Gas Policies and Regulations

Revised Code of Washington (RCW) 70.235.020 Greenhouse Gas Emissions Reductions

In 2008, RCW 70.235.020 established goals for GHG emissions reduction. These goals include the following:

The state shall limit emissions of GHGs to achieve the following emission reductions for Washington state:

- By 2020, reduce overall emissions of GHGs in the state to 1990 levels.
- By 2035, reduce overall emissions of GHGs in the state to 25% below 1990 levels.
- By 2050, the state will do its part to reach global climate stabilization levels by reducing overall emissions to 50% below 1990 levels, or 70% below the state's expected emissions that year.

The Seattle Center Arena Renovation Project is not subject to the reporting requirements of Chapter 173-441 WAC – Reporting of Emissions of Greenhouse Gases because its emissions from stationary on-site sources are well below the threshold for reporting.

RCW 47.01.440 Adoption of Statewide Goals to Reduce Annual per Capita Vehicle Miles

Reducing vehicle miles generally results in lower GHG emissions. RCW 47.01.440 establishes the following goals for reductions in annual per capita vehicle miles traveled, using 2004 as a baseline:

- Decrease the annual per capita vehicle miles traveled by 18% by 2020.
- Decrease the annual per capita vehicle miles traveled by 30% by 2035.
- Decrease the annual per capita vehicle miles traveled by 50% by 2050.

City of Seattle GHG Evaluation Requirement.

In 2008, Seattle adopted Ordinance 122574, which requires City planning staff "to evaluate climate impacts, including but not limited to those pertaining to carbon dioxide and other greenhouse gases when reviewing the environmental impacts of public or private proposals." The ordinance does not establish any thresholds, standards, or restrictions regarding GHG emissions.

City of Seattle Comprehensive Plan 2035

The City of Seattle Comprehensive Plan 2035 addresses climate change within its Environmental Element (City of Seattle, 2016a). Climate change-related goals and policies within the environmental element of the current Comprehensive Plan are listed in Appendix H. Specifically, Goal EN G3 calls for Seattle to reduce GHG emissions by 58% from 2008 levels by 2030, and become carbon neutral by 2050. Related policies include methods for reducing GHG emissions.

Other City of Seattle GHG-Related Policies and Ordinances

Seattle became the first city in the nation to adopt a green building goal for all new municipal facilities, and in 2001 the City created a Leadership in Energy and Environmental Design (LEED) incentive program for private projects.

City Resolution 30144 established Seattle City Light's long-term goal of meeting all of Seattle's electrical needs with zero net GHG emissions. Seattle City Light achieved GHG neutrality in 2005 through eliminating and reducing emissions, inventorying remaining emissions, and offsetting the remaining emissions, and has maintained GHG neutrality since that date (City of Seattle, 2013). Consequently, as Seattle City Light is the local electricity provider for the project area, electrical demand in the project area is not a source of GHG emissions.

City of Seattle Climate Action Plan

In 2011, the City Council adopted a long-term climate protection vision for Seattle (through Resolution 31312), which included achieving net zero GHG emissions by 2050 and preparing for the likely impacts of climate change. To achieve these goals, the City prepared a Climate Action Plan (2013 CAP) that focuses on City actions to reduce GHG emissions while also supporting other community goals. City actions in the 2013 CAP focus on road transportation, building energy, and waste, which comprise the majority of local emissions. With 2008 as the baseline year, the 2013 CAP identifies the following applicable targets by 2030:

- 20% reduction in vehicle miles travelled.

- 75% reduction in GHG emissions per mile of Seattle vehicles.
- 10% reduction in commercial building energy use.

The CAP goals also address residential development energy use, but this project does not relate to residential energy use.

10.3 AFFECTED ENVIRONMENT

10.3.1 Climate and Air Quality

Seattle is in the Puget Sound lowland, which is buffered by the Olympic and Cascade mountain ranges and Puget Sound. The Puget Sound lowland has a relatively mild, marine climate with cool summers and mild, wet, and cloudy winters.

The prevailing wind direction in the summer is from the north or northwest. The average wind velocity is less than 10 miles per hour. Persistent high-pressure cells often dominate summer weather and create stagnant air conditions, which occasionally contribute to the formation of photochemical smog.

Although the Puget Sound lowland area is the most densely populated and industrialized area in Washington, there is enough wind most of the year to disperse air pollutants released into the atmosphere. If poor dispersion persists for more than 24 hours, the PSCAA can declare an “air pollution episode” or local “impaired air quality.”

10.3.2 Air Quality Pollutants of Concern

Air quality is affected by pollutants that are generated by both natural and manmade sources. In general, the largest manmade contributors to air emissions are transportation vehicles and power-generating equipment, both of which typically burn fossil fuels. The main criteria pollutants of interest for land use development are CO, PM, ozone, and ozone precursors (volatile organic compounds [VOCs], and oxides of nitrogen [NO_x]). Both federal and state standards regulate these pollutants, along with 2 other criteria pollutants, SO_2 and lead. However, the Puget Sound region is in attainment and not a maintenance area for ozone, NO_2, lead, and SO_2 (EPA, 2018).

The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, metal processing is currently the primary source of lead emissions, and there would be no lead emissions associated with development under the Seattle Center Arena Renovation Project. Emissions of NO_2 associated with the project are estimated because they are a precursor to ozone formation and assessed relative to their potential impact on ozone concentrations. SO_2 emissions have dropped over the past 20 years because control measures were added for some sources, some larger SO_2 sources shut down, and the sulfur content of gasoline and diesel fuel was cut by nearly 90% (PSCAA, 2011). SO_2 emissions would not be appreciably generated by development under the project and, given the unclassified status of the region, are not further considered in this EIS analysis. The largest contributors of pollution related to development under the project are construction equipment, motor vehicles, and off-road construction equipment. The main pollutants emitted from these sources are CO, PM, ozone precursors (VOC and NO_x), GHGs, and Toxic Air Pollutants (TAPs). For more information on these pollutants and their health effects, see Appendix H.

10.3.3 Air Quality Information Sources, Monitoring, and Trends

The PSCAA monitors criteria air pollutant concentrations at 5 facilities within the Seattle city limits. The primary monitoring station within Seattle is in Beacon Hill, which is 4 miles from the project site. This station collects data for ozone, CO, NO_2, and SO_2. In 2014, PSCAA began operating a new station at 10th Ave S and S Weller St near I-5. PSCAA no longer monitors PM_{10} but is focusing its efforts on $PM_{2.5}$ because $PM_{2.5}$ is associated with the most serious health effects. Based on the most recent 3 years of available monitoring data at these locations, the air pollutant concentration trends for these pollutants remain below the NAAQS (PSCAA, 2017) (also see Appendix H).

Emission projections and ongoing monitoring throughout the central Puget Sound region indicate that the ambient air pollution concentrations for CO and $PM_{2.5}$ have been decreasing over the past decade. Measured ozone concentrations, in contrast, have remained fairly static. Regulations on fuel and motor vehicles reduced ozone concentrations from 1990 by more than 22% by 2016 (EPA, 2017).

10.3.4 Study Area

GHG emissions, as they contribute to climate change, are of a global concern and criteria air pollutants are a regional concern. However, the geographic scope of the air quality and GHG analysis focuses on project-related emissions. Consequently, the study area generally is the project site but also considers the indirect increase in vehicle miles travelled throughout the Puget Sound region resulting from the project.

10.3.5 Sensitive Receptors in the Study Area

Air quality does not affect every individual in the population in the same way, and some groups are more sensitive to adverse health effects than others. Population subgroups sensitive to the health effects of air pollutants include the elderly and the young; populations with higher rates of respiratory disease, such as asthma and chronic obstructive pulmonary disease; and populations with other environmental or occupational health exposures (e.g., indoor air quality) that affect cardiovascular or respiratory diseases. Land uses and facilities such as schools, children's daycare centers, hospitals, and nursing and convalescent homes are more sensitive than the general public to poor air quality because the populations associated with these uses have increased susceptibility to respiratory distress.

Residential areas are more sensitive to air quality conditions compared to commercial and industrial areas because people generally spend longer periods of time at their residences, with proportionally greater exposure to ambient air quality conditions.

Workers are not considered sensitive receptors because all employers must follow regulations set forth by the Occupational Safety and Health Administration to ensure the health and well-being of their employees relative to their own operations.

The sensitive land uses nearest the project site include the overnight shelter at Sacred Heart Church and multi-family residential uses and a daycare, along 1st Ave N and along Republican Way W and north of the site.

Pedestrians and outdoor recreational users at Seattle Center are not necessarily more sensitive to air quality impacts but can be more susceptible to irritation from fugitive dust and particulates than building occupants, because buildings often have windows closed and filters for outside air.

10.3.6 Existing Greenhouse Gas Emissions in Washington

Ecology estimated that in 2013, Washington produced about 94 million gross metric tons ($MMTCO_2e$; about 104 million U.S. tons) of CO_2 equivalents (CO_2e) (Ecology, 2016). (The abbreviation for "million metric tons" is MMT; thus, million metric tons of CO2 equivalents is written as MMTCO2e.) Transportation is the largest source, at 43% of the state's GHG emissions, followed by residential, commercial, and industrial energy use at 22%, and electricity generation (both in-state and out-of-state) at 19%. The sources of the remaining 16% of emissions are agriculture, waste management, and industrial processes.

10.3.7 Existing Greenhouse Gas Emissions in Seattle

The City updated its inventory of GHG emissions in 2016, which reflects emissions generated in 2014. Primary sources (core emissions) of GHG emissions include on-road transportation, building energy, and waste generation. Transportation sources comprise approximately 66% of inventoried emissions, while building energy (electricity generation and natural gas and other fuel combustion) comprise an additional 32%. Core GHG emissions of GHGs declined from 3.8 $MMTCO_2e$ in 1990 to 3.5 $MMTCO_2e$ in 2014, a 4% decline. This decline occurred despite an overall increase in population of 23% during the same period (City of Seattle, 2016b).

10.4 POTENTIAL IMPACTS

Impacts can be short term related to construction activities, or long term related to the permanent structure and operation of the project.

10.4.1 Construction Impacts

For the air quality and GHG analyses, the magnitude of construction-related impacts was classified as being either less-than-significant or significant. Significant impacts are defined below; impacts that do not meet that threshold are defined as less-than-significant.

Criteria for Significant Construction Impacts: The impact of construction-related criteria pollutants would be significant if total construction-related emissions were at or above the federal general conformity *de minimis* thresholds applicable in King County of 100 tons per year of carbon monoxide or fine particulate matter (PM10).

For the GHG analysis, as noted above, since Ecology retracted its prior guidance regarding significant impacts for GHG, there is no established quantitative threshold for GHG emissions for SEPA.

<u>No Action Alternative</u>

Under the No Action Alternative, no major construction would occur at the KeyArena site; therefore, there would be no construction-related emissions from this project. Construction associated with other projects at Seattle Center, private development in Uptown, and transportation projects in the area could cause increases in emissions.

Alternative 1: OVG Proposal

Short-term construction impacts related to Alternative 1 would result from temporary emissions associated with construction. Construction would generate air emissions through the use of heavy-duty construction equipment, from vehicle trips hauling materials, and from construction workers traveling to and from the project site. The assessment of construction air quality impacts considers each of these sources and recognizes that construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation, and (for dust) the prevailing weather conditions. These sources would also result in the emissions of GHGs.

Alternative 1 would include renovation of the interior of KeyArena, while maintaining the building's outer structural elements, including the Landmark-designated roof structure. The existing 1st Ave N Garage would be used for temporary staging and laydown during construction activities.

Excavation and demolition activities would require off-road equipment and trucks to off-haul excavated materials. Approximately 500,000 cubic yards of material would be excavated and hauled from the site. As described in Chapter 2, *Description of Alternatives*, construction of Alternative 1 would take approximately 24 months. During this period, air emissions would be generated from the use of heavy-duty construction equipment, from vehicle trips hauling materials, and from construction workers traveling to and from the project site. Mobile source emissions, primarily NOX, would be generated from the use of construction equipment such as excavators, bulldozers, wheeled loaders, and cranes. The off-hauling of excavated materials would be the predominant source of on-road emissions.

Construction-Related Air Pollutant Emissions

Air pollutant emissions were calculated for every year in which an action alternative is under construction. Table 10-1 shows the "worst-case" year or the maximum annual emissions for the project.

The construction-related criteria air pollutant emissions from development under Alternative 1 (Table 10-1) would be well below annual emission thresholds and would be considered a minor, temporary impact on air quality. Although temporary, fugitive dust could also affect adjacent residents, pedestrians, and outdoor recreation users. No significant air quality impacts with respect to emission of criteria air pollutants are anticipated for sensitive receptors in the vicinity of the project.

Table 10-1. Maximum Annual Construction-related Emissions for Alternative 1

Year	Maximum Annual Emissions (tons/year)				
	VOC	NOx	CO	PM10	PM2.5
2018	0.53	6.81	2.47	4.75	1.34
2019	1.71	17.24	8.88	5.41	2.08
2020	1.50	13.80	8.02	1.95	1.19
***De minimis* threshold for Puget Sound airshed**	**N/A**	**N/A**	**100[1]**	**100[1]**	**N/A**

[1] Notwithstanding the continued attainment of federal CO and PM_{10} standards, the Puget Sound region continues to be designated as a maintenance area for CO and PM_{10} and, therefore, is subject to the application of the *de minimis* threshold for CO and PM_{10} maintenance areas until EPA changes these designations to attainment.

Fugitive Dust

Demolition, excavation, grading, and other construction activities from the project may cause wind-blown dust that could contribute PM into the local atmosphere. Construction-related dust emissions would vary from day to day, depending on the level and type of activity, silt content of the soil, and the weather. In the absence of mitigation, dust generated from construction activities may result in adverse impacts on a temporary and intermittent basis during the construction period, particularly at immediately adjacent land uses. Therefore, BMPs for control of fugitive dust are included as a mitigation measure**.**

Construction-Related GHG Emissions

Construction-related GHG emissions would also be emitted by the use of off-road construction equipment as well as by haul truck, vendor truck, and construction worker vehicle trips. Maximum annual GHG emissions would occur during the first full year of construction (2019) totaling approximately 4,572 metric tons of CO2e. For comparison, Washington's GHG reporting threshold for facilities is 10,000 metric tons CO2e per year. The State of Washington GHG reporting threshold applies only to stationary sources and is exclusive of mobile sources. It is used in this analysis for reference because there is no quantitative threshold suggested by either EPA or the State of Washington with regard to construction-related GHG emissions.

Alternative 2: Modified Proposal

Impacts would be the same as described for Alternative 1 with regard to total emissions. Emissions for 2018 would be slightly lower due to fewer trucks hauling excavated material, and slightly higher in 2019 and 2020, reflecting the longer construction schedule associated with Alternative 2.

10.4.2 Operations Impacts

For the air quality and GHG analyses, the magnitude of operations-related impacts was classified as being either less-than-significant or significant. Significant impacts are defined below; impacts that do not meet that threshold are defined as less-than-significant.

Criteria for Significant Operations Impacts: The operations impacts associated with the project would be significant if they were to result in operational emissions at or above the federal general conformity *de minimis* thresholds applicable in King County of 100 tons per year of carbon monoxide or fine particulate matter (PM10).

For the GHG analysis, as noted above, since Ecology retracted its prior guidance regarding significant impacts for GHG, there is no established quantitative threshold for GHG emissions for SEPA.

No Action Alternative

Under the No Action Alternative, operations at the KeyArena site would continue as currently managed, with no increase in annual events resulting from physical improvements to KeyArena or policy changes. Under the No Action Alternative, sporting events, concerts, and other events would generate approximately 29.2 million VMT per year. Future operations of other projects at Seattle Center, private development in Uptown, and transportation projects in the area could cause increases in emissions.

Alternative 1: OVG Proposal

The project would result in additional annual concerts, sporting events, family shows, community-oriented events, and other events, and would also increase capacity of the arena. Consequently, the increase in events would generate new vehicle trips to and from the event by attendees as well as by workers and supporting delivery trucks and buses for vendors and performers.

Data provided by the transportation consultant analyst estimate that each weekday sporting event would result in generation of 311,274 VMT, while each weekend concert event would generate 549,255 VMT (Fehr & Peers, 2018). Based on an increase of 100 sporting events and 30 concert events per year, total annual VMT is predicted to increase by 47.6 million miles per year.

Resulting increases in annual air pollutant and GHG emissions from mobile sources were calculated using the increase in VMT and composite emission factors developed for years 2020 and 2035.

Operational Air Pollutant Emissions

Operational emissions of criteria air pollutants from the increase in the number and attendance of events at Seattle Center Arena are presented in Table 10-2 for the first year of operation (2020) as well as for the future year (2035) used in the transportation analysis. As can be seen from the table, the only pollutant that would come close to the 100 ton per year *de minimis* emission threshold would be CO, which would fall just below this value in year 2020. By year 2035, improvements to the statewide motor vehicle fleet would result in significant reductions to air emissions from the project, with CO emissions dropping by more than 50%. Because the project would not result in operational emissions at or above the federal general conformity *de minimis* thresholds applicable in King County of 100 tons per year for CO or PM10, air pollution emissions would result in a less-than-significant impact. It is acknowledged, however, that the estimated emissions for CO in 2020 are just under the threshold, and without expected reductions associated with fleet improvements, significant impacts could occur.

Table 10-2. Maximum Annual Operational Emissions for Seattle Center Arena Renovation

Year of Analysis	Maximum Annual Emissions (tons/year)				
	VOC	NOx	CO	PM_{10}	$PM_{2.5}$
2020 – First Year of Operation	3.28	46.18	99.46	28.11	6.53
2035	0.84	14.89	37.77	26.89	5.40
***De minimis* threshold for Puget Sound airshed**	**N/A**	**N/A**	**100[1]**	**100[1]**	**N/A**

[1] Notwithstanding the continued attainment of federal CO and PM_{10} standards, the Puget Sound region continues to be designated as a maintenance area for CO and PM_{10} and, therefore, is subject to the application of the *de minimis* threshold for CO and PM_{10} maintenance areas until EPA changes these designations to attainment.
CO = carbon monoxide; N/A = not applicable; NOx = nitrogen oxides; $PM_{2.5}$ = fine particulate matter; PM_{10} = particulate matter; VOC = volatile organic compounds.

Operational GHG Emissions

Increased GHG emissions from the greater number and attendance of events during operation of the project include sources such as transportation, increased solid waste disposal, increased water usage,

and increased wastewater generation. Table 10-3 presents the estimated GHG emissions associated with the project for each source type.

Transportation-related (mobile source) emissions were estimated with the same methodology used in the analysis of air quality emissions. Mobile source emissions represent over 99% of total emissions. These mobile emissions reflect the substantial trip lengths that event attendees would travel as the NBA, NHL, and concert events would draw from throughout the northwest region. Average trip lengths were based on residence zip codes from basketball/celebrity tennis and concert databases compiled for the transportation analysis, with all trips less than 5 miles removed due to the likelihood of travel by modes other than private vehicle. The concert database includes some long distance trips from Portland, Oregon and Vancouver, British Columbia that influence average trip length.

Table 10-3. Operational GHG Emissions (metric tons [MT] of CO2e per year)

Emission Source	Total Emissions (MT/Year)
	Total CO_2e
Mobile Sources (2020)	26,751
Mobile Sources (2035)	22,372
Solid Waste	3.4
Water	83
Wastewater	142
Natural Gas	1,207
Total 2020	**28,187**
Total 2035	**23,808**

Note: Columns may not total precisely due to rounding.
Source: Prepared by ESA, 2018.

As can be seen from Table 10-3, the project would initially result in GHG emissions exceeding 28,000 metric tons per year in its first full year of operation (fall 2020 to fall 2021) if the arena provided events for both an NBA and NHL team. However, implementation of clean air requirements for motor vehicles in Washington State would reduce GHG emissions over time. By 2035, this would reduce GHG emissions from the project by an estimated 16% as compared to 2020.

As described above, the City prepared a Climate Action Plan (City of Seattle, 2013), and the Environment Element of the City's 2035 Comprehensive Plan targets a 20% reduction in VMT by 2030 (using 2008 as a baseline). Additionally, Washington State targets a reduction in statewide VMT of 18% by 2020 and 30% by 2030 (using 2004 as a baseline).

The project would increase VMT in the region and within the Seattle city limits, which is inconsistent with City and Washington State goals of reducing VMT as a strategy for reducing GHG emissions. The increase in GHG emissions that would result from this is small, however. These emissions are equivalent to approximately 0.03% of the total GHG emissions statewide (comparing the projected 2020 emissions from the project to the 2014 GHG emissions estimate). Assuming that up to 50% of the VMT would

occur within Seattle city limits, GHG emissions from the project are equivalent to approximately 0.4% of the total GHG emissions citywide (comparing the projected 2020 emissions from the project to the 2014 GHG emissions estimate).

The project would also produce additional demand for small amounts of electricity, solid waste disposal, water, wastewater treatment, and natural gas.

Electricity use can produce GHG emissions if the electricity is generated by the combustion of fossil fuel. As described relative to the City CAP above, the local electricity provider, Seattle City Light, is carbon neutral and has been for over a decade. Consequently, there would be no incremental GHG emissions associated with the increased electrical demand of the project.

Resulting emissions associated with waste generation and disposal in landfills are indirect. Landfills emit anthropogenic methane from the anaerobic breakdown of material.

Water and wastewater generation rates and solid waste generation rates specific to arena land uses (CAPCOA, 2017) were used to estimate GHG emissions, in lieu of the availability of data specific to arenas in Washington State and, therefore provide a conservative estimate. The additional events that would occur as a result of this project would constitute roughly 50% of the total events that would occur at the arena annually. Therefore, it was estimated that the additional demand from the increased number of events under Alternative 1 would generate 50% of the operational, water, wastewater, and solid waste typically associated with a typical arena of this size.

Water and wastewater demand generate GHG emissions through the electricity used for the treatment and transport of both water and wastewater, which may occur outside the service area of Seattle City Light. Indirect emissions from increased electricity associated with water and wastewater use were estimated using City Light's CO_2 emission factor for electricity generated by gas-fired combustion turbines. Consequently, an emission factor of 857 pounds of CO_2 per megawatt hour was used (Seattle City Light, 2012), which reflects the use of electricity derived from these more marginal resources.

Natural gas use results in the emissions of 2 GHGs: methane (the major component of natural gas) and CO_2 from the combustion of natural gas. Based on similar assumptions as used for water consumption, the additional demand resulting from the increased number of events from the project would generate 50% of the operational natural gas consumption typically associated with an arena of this size.

Alternative 1 would include energy reduction measures that would continue to reduce GHG emissions under the proposed project:

- The arena would be renovated to meet a minimum LEED threshold. LEED is a rating system to evaluate the environmental performance of a building.
- Building Tune-up – Building tune-ups are a recent City requirement that all non-residential buildings over 50,000 square feet have a building energy "tune-up" every 5 years, to optimize energy and water performance.
- Seattle Center participates in the Municipal Energy Efficiency Program (MEEP), to reduce energy use in facilities campus wide, including the arena.
- Implementation of carpool incentive programs for employees.
- Implementation of waste diversion at KeyArena.

Alternative 2: Modified Proposal

Operations impacts would be the same as described for Alternative 1.

10.5 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

10.5.1 Construction

The following measure is recommended to avoid or minimize impacts to air quality:

- Control fugitive dust from demolition and hauling that could impact pedestrians and recreational users at Seattle Center.
- Cover all haul trucks transporting soil, sand, or other loose material off-site.
- Remove all visible mud or dirt track-out onto adjacent public roads.
- Comply with Seattle Center Campus Rules, including speed limits.

10.5.2 Operations

No additional mitigation is necessary for impacts to air quality from criteria air pollutants. No additional mitigation is required for GHG from non-mobile sources. Mitigation described in Chapter 4, *Transportation*, to reduce the total volume of vehicles arriving to events would also provide mitigation for GHG emissions from mobile sources.

10.6 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON AIR QUALITY AND GHG EMISSIONS

There would be no significant and unavoidable adverse impacts to air quality or GHG emissions from either action alternative.

11.0 PUBLIC SERVICES AND UTILITIES

This chapter considers the potential impacts the proposed project may have on the provision of public services and utilities. Public services addressed in this section include fire, police, and school services. Utilities evaluated include water, sewer, stormwater, and electricity.

Key Findings for Public Services and Utilities

Existing local and regional emergency services are expected to be adequate to address any increased demand from the renovated arena. Impacts on response times to incidents at the Seattle Center during construction are expected to be less-than-significant. Seattle Center and OVG will coordinate with existing utility service providers to ensure that adequate utility service is available.

11.1 METHODS

Public service providers and utility services in the study area were obtained from online sources and from Seattle Center. Construction impacts were analyzed by identifying construction activities that could temporarily limit, disrupt, or displace public services and/or utilities in the study area. Operations impacts were analyzed by identifying the services and utilities proposed in the alternatives and by considering how existing services would (or would not) change following implementation.

11.2 REGULATORY CONTEXT

Public services in the State of Washington, including the City of Seattle, are governed by the Growth Management Act and local comprehensive plans. Comprehensive plans describe general provisions for police, fire, and emergency services, as well as schools and public utilities such as water, wastewater, stormwater, and garbage pickup.

Public services are provided under Article VI (Police) and Article X (Fire) of the Charter of the City of Seattle, enacted as law, for the purpose of protecting and enhancing the health, safety, environment, and general welfare of the people and to enable the municipal government to provide services and meet the needs of the people efficiently.

SMC 15.52 requires crowd control for events, as determined by the Special Events Committee. The committee can require a special events permit, which may include the following provisions related to public services and utilities:

- Crowd control, traffic control, safety, and security.
- Compliance with health and sanitary regulations as required by the Seattle-King County Health Department for the event.
- Coordination with the Fire Department or medical personnel for emergency treatment and evacuation of people who may need immediate care, cardio-pulmonary resuscitation, or ambulance service.
- Emergency communications, fire suppression equipment with structures, and maintenance of unobstructed emergency passageways.

- Proper waste, recycling, and compost receptacles and a disposal plan as explicated by Seattle Public Utilities, as well as a clean-up plan.

11.3 AFFECTED ENVIRONMENT

11.3.1 Study Area

The primary study area for public services and utilities is the Seattle Center, and the secondary study area is Uptown (Figures 7-1 and 7-2, respectively, in Chapter 7, *Recreation*).

11.3.2 Current Public Services

Police and Security

The Seattle Police Department (SPD) provides police protection services to the City of Seattle, including the Seattle Center. The Seattle Center is served by the West Precinct, located at 810 Virginia St.

Seattle Center provides campus security, including for emergencies and disaster response. Seattle Center staff are trained in preparedness policies and procedures to respond to emergencies of various types (Seattle Center, 2018).

Fire

The Seattle Fire Department provides fire and rescue response, fire prevention and education, fire investigation, and emergency medical services throughout the city, including the Seattle Center. Emergency medical services include basic life support and advanced life support. Fire Station 2, located at 2334 4th Ave, serves the Seattle Center.

Schools

Seattle Public Schools (SPS) serves nearly 52,000 students in 97 schools throughout the City of Seattle. Seattle Center is within the Hay Elementary and Queen Anne Elementary attendance area for elementary school, McClure attendance area for middle school, and the Ballard High School attendance area for high school (SPS, 2018). The Seattle Center site contains 1 public school, the Center School, within the Center House. The Center School is a high school for approximately 300 students in grades 9 through 12 (SPS, 2018). The Downtown School, at 204 Warren Ave N, is a private high school that is slated for opening in the fall of 2018. This school, owned and operated by Lakeside School, is anticipated to accommodate 160 students at full enrollment (The Downtown School, 2018).

11.3.3 Current Utilities

The original electrical, water, and wastewater utility infrastructure was built in 1962 as part of the World's Fair campus. Some of the current utilities serving Seattle Center are likely original, while others have been added and upgraded over the years.

Electricity

Electricity is provided to the City of Seattle, including the Seattle Center area, by Seattle City Light (SCL). SCL is an electric utility owned by the City of Seattle. With the completion of the Denny Substation project, the existing Broad Street Substation and transmission infrastructure is expected to meet future needs through 2035 (Seattle City Light, 2015). SCL is planning to construct a utility vault and relocate utilities on Thomas St. It is anticipated this work would be completed in 2018.

Water, Sewer, Stormwater, Garbage

Seattle Public Utilities (SPU) operates a regional water supply system that provides drinking water to most of King County, including the City of Seattle. A network of water supply pipes is located throughout Seattle Center to supply water to the entire campus.

Local sewer and stormwater collection service to Seattle Center is provided throughout the campus in lines owned and maintained by SPU and transported to wastewater treatment facilities owned and operated by King County Wastewater Treatment Division (WTD). The pipelines surrounding the Seattle Center are combined sewer and storm drainage lines. King County WTD also owns and operates a 72-inch brick sewer, the Lake Union Tunnel constructed in 1894, beneath the southeast portion of the 1st Ave N Garage.

Garbage and recycling pickup service is managed throughout the city by SPU.

Communications

Cable television, internet connectivity, and telephone service in the area are provided by private utility companies (Comcast, Wave Broadband, Century Link, and others). Comcast and Wave Broadband have franchise agreements with the City for placement of their cable transmission lines within the public right-of-way. Free Microsoft Wi-Fi is currently available at Seattle Center.

11.4 POTENTIAL IMPACTS

Impacts can be short-term related to construction activities, or long-term related to the permanent structure and operation of the project.

11.4.1 Construction Impacts

Potential short-term impacts on public services and utilities include the loss or delay of a service during construction activities. The magnitude of the potential impact on public services and utilities is classified as less-than-significant or significant. Significant impacts are defined below; impacts that do not meet that threshold are defined as less-than-significant.

Criteria for Significant Construction Impacts: The construction impacts would be significant if they caused: (1) a disruption in emergency service response time that results in a substantial delay of service; (2) a disruption or delay in a utility service that results in lengthy, widespread, or substantial loss of service or in loss of business; or (3) restoration of the utility would be lengthy and/or difficult, resulting in lengthy service loss.

No Action Alternative

Under the No Action Alternative, no major construction would occur at the KeyArena site. Construction associated with other projects at Seattle Center, private development in Uptown, and transportation projects in the area could cause noise, traffic, and detours that could cause emergency response delays or utility disruptions to the Seattle Center.

Alternative 1: OVG Proposal

During construction, emergency response time to the Seattle Center for police and fire may increase slightly. Non-emergency response times could also increase, primarily due to temporary street changes, construction vehicles and equipment, and by increased traffic and congestion on roads affected by active construction. Refer to Chapter 4, *Transportation*, for a more detailed analysis of construction-related impacts relating to traffic and congestion. The increased congestion and delays would have an impact on emergency vehicle access to and from the construction area. The Seattle Center Integration Agreement will include coordination of public services and utilities during construction (and operation) of the arena. Because of the plan to coordinate construction activities and public services, and the temporary nature of these impacts, they would be less-than-significant.

The Center School and The Downtown School may experience disruptions during construction. Students may experience some delay reaching school due to temporary construction detours, or experience increased noise during active construction. These impacts would be sporadic and temporary and would be less-than-significant.

As noted by OVG, electric, water, and wastewater utilities that are currently networked though connections that serve the Seattle Center campus will be separated to allow the renovated arena to operate under new, upgraded utility connections.

During construction, short-term disruptions to utilities, including communications, could occur due to construction activities or the need for relocation of underground systems. These disruptions may impact Seattle Center tenants, as well as nearby areas, and are anticipated to be short-term and intermittent, while the alternate connection is made. The City's electric, water, and wastewater utility providers are identifying utility separation and system upgrade needs to avoid or minimize disruptions to services during construction activities. Inadvertent damage to underground utilities could occur during construction if utility locations are uncertain or misidentified. Although such incidents are infrequent, such a disruption could result in a longer service outage than a planned outage. Because of the temporary nature of these impacts, they would be less-than-significant.

Based on information available at the time of Draft EIS publication and recent discussions with SPU, it is anticipated that adequate water is available to meet demand, including for fire flow, and that adequate sewer capacity is available to convey the increased wastewater flows from the expanded arena. To ensure that construction-related impacts to King County's 120-year-old 72-inch brick lined sewer do not occur, the project designers will coordinate with King County WTD. With proper planning and utility sizing, impacts to the County's sewer system would be less-than-significant. Construction-related stormwater at the site will be managed in accordance with SPU requirements, to minimize off-site discharge of stormwater.

Garbage and recycling pickup locations may need to be temporarily relocated as a result of construction activities, depending on where active construction is occurring. Because the temporary relocation would not result in a lack or reduction of service, this impact would be less-than-significant.

Alternative 2: Modified Proposal

Construction impacts associated with Alternative 2 would be similar to those described for Alternative 1.

11.4.2 Operations Impacts

Potential impacts on public services and utilities include the loss of, or a significant delay in, a service or utility.

The following defines long-term (operations) impacts to public services and utilities. The project would have an adverse impact on these elements if it caused a substantial disruption or change to existing or emergency service providers or to public utility service in the area. The magnitude of the potential public services and utilities impacts is classified as less-than-significant or significant. Significant impacts are defined below; impacts that do not meet that threshold are considered less-than-significant.

Criteria for Significant Operations Impacts: The operations impacts would be significant if they caused a permanent increase in demand for public services, or permanent changes in response times that could tax the ability to provide adequate emergency response services; or a loss of utility service or inadequate utility capacity through operation of the facility that cannot be mitigated.

No Action Alternative

Operations impacts to public services and utilities would remain unchanged from existing conditions under the No Action Alternative.

Alternative 1: OVG Proposal

As with other events throughout the city, SPD may need additional traffic flow and parking enforcement officers to staff events at the Seattle Center Arena during, or after, major events since traffic will be congested and parking in the area is limited. These events are typically staffed with off-duty police officers. Because of the scheduled nature of events at the arena and the ability to plan well in advance for large events, this increase in police activity would be less-than-significant.

Operations impacts to schools would not change as a result of the project. Events such as major concerts and sporting events would largely be scheduled when school is out of session (i.e., in the evenings or on weekends).

Increased demand for water and sewer service would periodically occur as a result of operation of the larger arena facility. Increased attendance at events at the arena would result in corresponding increased demand in water and sewer service, as well as increased refuse/recyclable material generation. Increased demand for electricity would occur as a result of more events held at the arena each year.

Utility system upgrades would result in additional capacity as well as greater opportunities to reduce or manage service demands. Separating arena electric, water, and sewer service demands from the existing Seattle Center campus facilities would provide greater capacity to Seattle Center, including the arena. The upgraded systems will likely be sufficient to meet increased demand from the larger arena and more frequent events, and will also create additional capacity and redundancies for the remaining Seattle Center systems. Updated utility systems would incorporate higher efficiency systems, which would result in lesser demand on the utilities serving the arena.

The water and wastewater demands of the project will be calculated during project design, reviewed and approved by SPU and King County WTD, and accommodated during construction of the facility. Stormwater runoff from impervious surface areas will be detained on-site and released at no more than pre-development rates and volumes, as prescribed by King County and the City.

Additional garbage and recyclables pickup can be accommodated by providers with advanced notice. Community members in Uptown have expressed concerns about garbage and recycling pickup extending into the neighborhood following larger and more frequent events at the renovated arena. Because of the ability to plan for and accommodate these services, this increase in utility demand would be less-than-significant.

OVG will provide 5G and Wi-Fi coverage for visitors to the arena and into the surrounding plazas. Major cellular service providers will also be engaged to bring their services to the new arena for coverage inside and outside the facility. The coverage will also provide the necessary connectivity for life safety communications purposes.

Alternative 2: Modified Proposal

Because the arena capacity and number of events would be the same as Alternative 1, impacts to public services and utilities would be identical to Alternative 1.

11.5 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

11.5.1 Construction

Mitigation measures for construction traffic impacts are described in *Transportation*, Section 4.5.1. The project would obtain permits and approvals required by the City of Seattle for construction activities, including traffic, which would minimize the delay of emergency vehicles to the Seattle Center and surrounding area. All construction would be conducted in compliance with the City of Seattle Fire Code, which is based on the International Fire Code and provides minimum standards for fire and life safety for buildings, access roads, and fire protection equipment installation (SDCI, 2015). Workplace safety and construction site BMPs, such as fencing, designated pedestrian walkways, business access points, signage, etc., will be used to protect construction workers, pedestrians, and visitors to Seattle Center during active construction.

Close coordination with utility providers and utility separation work will reduce utility outages to area businesses and residences, including Seattle Center tenants. Potholing and utility location and identification would be conducted in advance of any construction activity to minimize the potential to inadvertently disrupt underground utility services.

Construction drawings of the project will be sent to King County WTD for review to ensure that construction activities will not impact the County's 72-inch brick sewer in the project vicinity. Coordination with SPU and King County during project design will reduce the potential for construction-related impacts to existing pipes or other facilities.

Communication to area users, including Seattle Center tenants, in advance of any planned temporary service outages will allow users and residents to plan accordingly, thus minimizing the impact of a temporary service outage.

OVG would hire a full-time Community Liaison to coordinate with local community organizations during the construction phase to minimize impacts to the surrounding community.

11.5.2 Operations

Alterative 1: OVG Proposal

In addition to the Seattle Fire Code described above, adequate fire flow will be provided to serve the arena, as well emergency access requirements as prescribed under the Fire Code provisions. The Seattle Center Integration Agreement will include coordination of public services and utilities during operation of the arena.

Police and Security

Operation of the arena would be conducted in a manner that promotes a safe experience for all attendees. Both the NBA and NHL strive to adhere to their respective codes of conduct for fans. Below are excerpts from the NBA Fan Code of Conduct that would result in orderly sporting events and the reduced need for police activity. The NHL has a similar fan conduct code.

NBA Fan Code of Conduct

The NBA and team arenas are committed to creating a safe, comfortable, and enjoyable sports & entertainment experience (NBA, 2018). NBA fans have a right to expect an environment where:

- Guests will enjoy the basketball experience free from disruptive behavior, including foul or abusive language or obscene gestures.
- Guests will consume alcoholic beverages in a responsible manner. Intervention with an impaired, intoxicated, or underage guest will be handled in a prompt and safe manner.
- Guests will not engage in fighting, throwing objects, or attempting to enter the court, and those who engage in any of these actions will immediately be ejected from the game.
- Guests will comply with requests from arena staff regarding arena operations and emergency response procedures.

The arena staff will be trained to intervene where necessary to ensure that the above expectations are met, and guests are encouraged to report any inappropriate behavior to the nearest usher, security guard, or guest services staff member.

As required by SMC 15.52, a Special Events permit is required for major events, which requires coordination with fire, police, and emergency services.

Utilities

As part of the proposal, OVG is planning to install low-flow plumbing fixtures to reduce the amount of water and wastewater demand during events. The project will incorporate water-efficient and bio-retention landscaping where feasible, and rainwater harvesting/irrigation reuse will be studied during

design to reduce peak stormwater runoff. The renovated arena will include modern water- and energy-efficient fixtures, which will reduce the demand on electrical and water and wastewater utilities. The project will comply with the City's Energy Code requirements to achieve energy savings.

OVG would hire a full-time Community Liaison who would run outreach operations, including coordinating with local community organizations, to minimize impacts to utilities associated with operation of the renovated arena. Ensuring adequate garbage and recycling collection and overall neighborhood cleanliness are efforts that the liaison would oversee.

Alternative 2: Modified Proposal

Mitigation measures would be the same as those described for Alternative 1.

11.6 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON PUBLIC SERVICES AND UTILITIES

There would be no significant and unavoidable adverse impacts on public services or utilities from either action alternative.

12.0 PLANTS

This chapter provides an analysis of potential impacts to plants within the study area. Consistency of the alternatives with relevant plans, policies, and regulations is also provided. Because the KeyArena site is an existing facility within an urban area, it provides minimal habitat to animals that are not adapted to urban environments.

Key Findings for Plants

Construction Impacts: Alternative 1 would remove up to 9 trees designated as exceptional, legacy, and/or street trees. Alternative 2 would remove up to 5 trees designated as exceptional, legacy, and/or street trees. Trees would be replaced at a 2:1 ratio or greater. Removal of trees would not be significant.

Operations Impacts*:* Removal of large trees would result in a temporal loss of tree canopy because replacement trees take many years to grow to mature size.

12.1 METHODS

Potential impacts were evaluated by reviewing the documents and other sources listed below. Given the urban nature of the environment, the analysis focuses on exceptional, legacy, and street trees (as defined in Section 12.3.4, below). The study area is limited to the project site and immediately adjacent streets (Figures 2-2 and 2-6 in Chapter 2, *Description of Alternatives*).

The following data sources were reviewed:

- Arborist Report (Urban Forestry Services, 2018).
- Memorandum re: Appraisal of Trees to be Impacted (Tree Solutions, 2018).
- Century 21 Design Guidelines, Chapter 2: Landscape Management Plan (Seattle Center, 2009).
- Urban Forest Stewardship Plan (City of Seattle, 2013).
- U.S. Fish and Wildlife Service (USFWS) Critical Habitat Mapper (USFWS, 2018).
- Washington Natural Heritage Program Database (WDNR, 2018).
- Priority Habitats and Species Database (Washington Department of Fish and Wildlife [WDFW], 2018a).
- Washington State Species of Concern Lists (WDFW, 2018b).
- Geographic Information System (GIS) data from SDCI (City of Seattle, 2018).
- Seattle Tree Inventory Map (SDOT, 2017).

The study area is urbanized, with most of the area covered with impervious surfaces. However, there are several large trees that surround the site as well as smaller shrubs and landscaped areas that provide habitat for urban-adapted wildlife such as crows, gulls, some songbirds, raccoons, and rodents. There are no Priority Habitats and Species (WDFW, 2018a), State Species of Concern (WDFW, 2018b), and no critical areas (City of Seattle, 2018) within or immediately adjacent to the study area. There is no critical habitat for federally threatened species listed for the area. Bald eagles may be seen in the study area, but there are no known bald eagle nests in the study area (USFWS, 2018; WDFW, 2018a). No populations of threatened or endangered plant species are documented in the study area (WDNR,

2018). Due to the urban nature of the study area, animals and non-protected plants are not addressed further in this EIS analysis.

12.2 REGULATORY CONTEXT

Trees on the Seattle Center campus are protected by SMC 25.11 and Executive Order (EO) 2017-11 (Tree Protection), EO 03-05 (Tree Replacement), Director's Rule (DR) 30-2015 (Standards for Landscaping, including Green Factor), and DR 16-2008 (Designation of Exceptional Trees). Street trees in the public right-of-way, are regulated by SMC 15.43, Tree and Vegetation Management in Public Places. Trees (especially the management of canopy trees) are an important element of the Seattle Center Master Plan (Seattle Center, 2008), Landscape Management Plan (Seattle Center, 2009), and the Urban Forest Stewardship Plan (City of Seattle, 2013).

12.3 AFFECTED ENVIRONMENT

12.3.1 Study Area

The study area includes the project site and to the centerline of immediately adjacent streets (including vacated 2nd Ave N to the east of KeyArena) (Figures 2-2 and 2-6 in Chapter 2, *Description of Alternatives*).

The study area is urbanized, with most of the area covered with impervious surfaces. However, there are several large trees that surround the site as well as smaller shrubs and landscaped areas.

Trees (especially the management of canopy trees) are an important element of the Seattle Center Master Plan (Seattle Center, 2008), Landscape Management Plan (Seattle Center, 2009), and the Urban Forest Stewardship Plan (City of Seattle, 2013). Trees shape the character of Seattle Center and ensure that it is a dynamic and engaging public space and an important component of the aesthetics, feel, and history of Seattle Center.

Seattle Center recognizes "exceptional trees," "legacy trees," and "dedicated trees" on the campus.

12.3.2 Exceptional Trees

Exceptional trees are defined in SMC 25.11. An exceptional tree designation is given when a tree or group of trees that, because of unique historical, ecological, or aesthetic value, constitutes an important community resource. The purpose of SMC 25.11 is to encourage the protection of trees over a certain size and exceptional trees, which are trees with unique historical, ecological, or aesthetic value to the community. There are approximately 8 exceptional trees in the study area (Urban Forestry Services, 2018).

12.3.3 Legacy and Dedicated Trees

A legacy tree is a Seattle Center designation given to a tree or group of trees that are considered important community resources because of unique or noteworthy characteristics or values; some of these legacy trees pre-date the 1962 World's Fair. Legacy trees can also be exceptional or street trees. A dedicated tree has a plaque, marker, or other documentation on file to commemorate its prominence. There are 53 legacy trees and no dedicated trees within the study area. The Landscape Management

Plan identifies 3 potential legacy trees in the International Plaza north of the existing KeyArena. Two of these 3 trees are also considered exceptional under SMC 25.11. The London plane trees that line vacated 2nd Ave N to the east of KeyArena and the International Fountain Pavilion are also legacy trees. All London plane trees on the Seattle Center campus are legacy trees. Seattle Center's policy is to retain legacy and dedicated trees if possible, but allows for the removal or relocation of these trees if other options are infeasible (Seattle Center, 2009).

12.3.4 Street Trees

Street trees are "trees located in public places which includes public right-of-way and the space above or beneath its surface, whether or not open or improved, including streets, avenues, ways, boulevards, drives, places, alleys, sidewalks, planting strips, squares, triangles, and plazas that are not privately owned" (SDOT, 2014). Street trees are regulated under SMC 15.43. Street trees are located around the perimeter of the study area and along Thomas St. Street trees that may be affected by the project line 1st Ave N, Thomas St, Warren Ave N, and John St (SDOT, 2017).

12.4 POTENTIAL IMPACTS

This section evaluates potential impacts to trees for the No Action Alternative and Alternatives 1 and 2.

12.4.1 Construction Impacts

Criteria for determining short-term potential impacts to plants from construction are characterized as less-than-significant or significant. Potentially significant impacts are defined below; impacts that do not reach this threshold are determined to be less-than-significant.

Criteria for Significant Construction Impacts: The impacts of construction activities would be significant if they would be disruptive and/or continue long enough to result in a permanent loss of exceptional, legacy, dedicated, or street trees or other vegetation that cannot be mitigated.

No Action Alternative

Under the No Action Alternative, there would be no demolition or construction at the site. There would be no expected changes to exceptional, legacy, or street trees, other than regular management. If a tree becomes unhealthy, dies, or a hazard to public safety, it may be removed. Impacts to plants (trees) would be less-than-significant.

Alternative 1: OVG Proposal

Trees would be protected during construction in accordance with SMC 25.11, DR 30-2015, and the Street Tree Manual (2014) to avoid impacts to the extent possible. Construction activities near exceptional, legacy, or street trees have the potential to damage a tree's roots or canopy.

For Alternative 1, up to 9 exceptional, legacy, and/or street trees would be removed during construction. See Figure 12-1 for exceptional, legacy, and/or street trees that are proposed for removal. Installation of the foundation walls at the north end of the arena and its expanded underground footprint would require the removal of 1 exceptional/legacy tree and 1 legacy tree in the International Plaza.

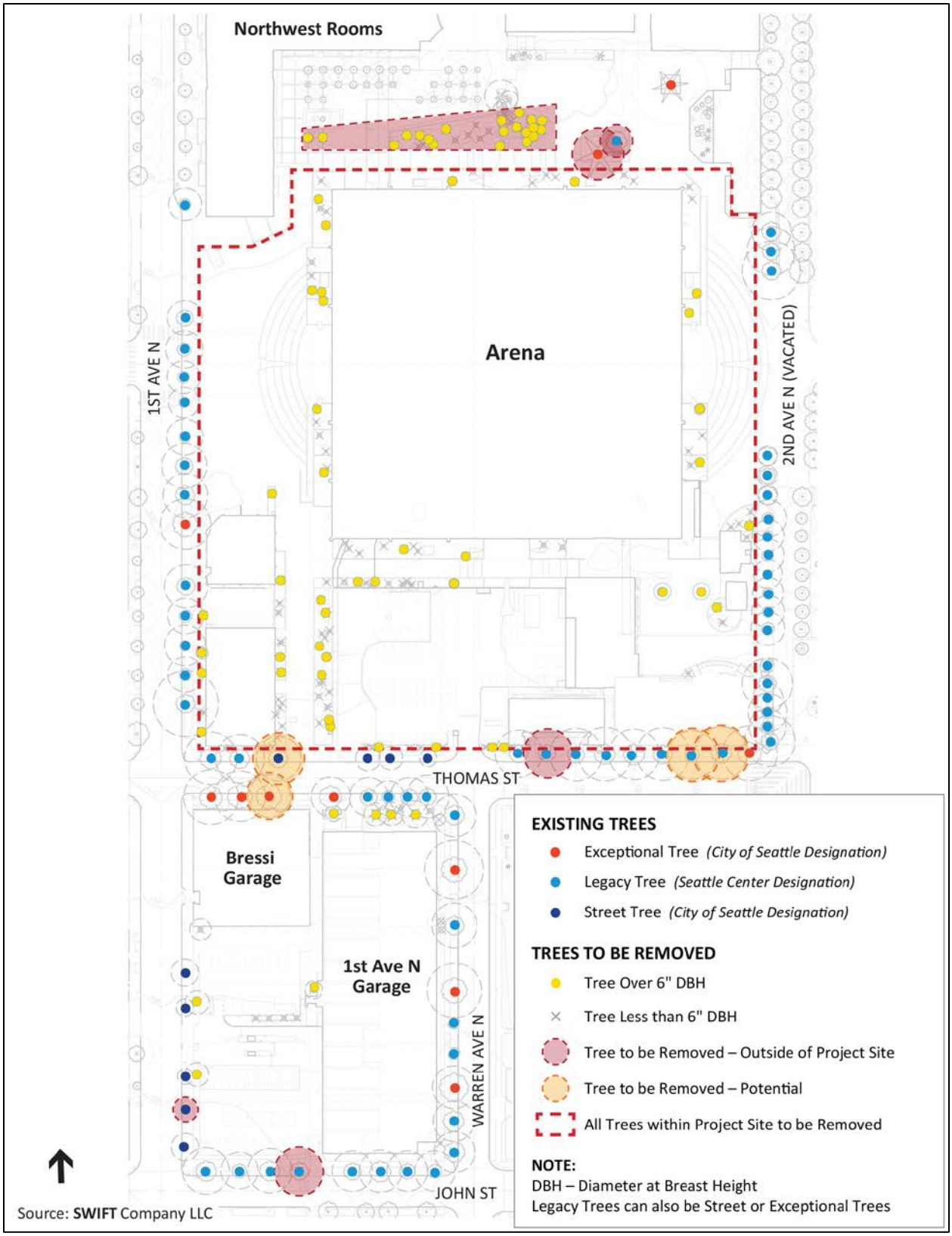


Figure 12-1. Trees to be Removed under Alternative 1

Construction of the underground parking garage entrance on Thomas St would require the removal of 1 street tree. Construction of the garage entrance on John St would require the removal of 1 legacy/street tree, and 1 street tree would be removed for the loading dock tunnel entrance on 1st Ave N. Two legacy/street trees are proposed to be substantially trimmed or removed on the north side of Thomas St between Warren Ave N and 2nd Ave N for construction activities, including loading/unloading via conveyors from Thomas St and installation of a tower crane at the south end of the arena. The roots of street trees along Thomas St may be impacted by tunneling under the street (under the trees). Depending on the depth, tunneling activities could destroy tree roots, which in some cases could ultimately kill the trees. If an open cut is used to construct the loading dock tunnel, up to 2 legacy/street trees along Thomas St would be removed.

Additionally, all existing landscaping, shrubs, and trees larger than 6-inches diameter at breast height that are not exceptional, legacy, or street trees on the arena parcel of the project site would be removed (approximately 60 trees). Figure 12-1 shows trees to be removed within the project site. The removal of legacy, exceptional or street trees would be a less-than-significant impact because they can be replaced with mitigation. All plazas would be redesigned, and new landscaping would include a number of trees. Preliminary landscape drawings include at least 100 new trees.

Photo 12-1. Legacy Trees Proposed for Removal Under Alternative 1

SMC 25.11.090 requires tree replacement at a ratio of at least 1:1. However, EO 03-05 (Tree Replacement) requires all City departments to replace every tree removed from City-owned land with 2 new trees (2:1 ratio). EO 2017-11 (Tree Protection) clarifies that trees may be replaced at a higher ratio at the request of SDOT (for street trees) or Seattle Center (for all other trees). City plans promote the retention of existing trees and tree canopy on City-owned land but allow for their removal if certain conditions are met.

The Seattle 2035 Comprehensive Plan has a policy to “Enhance wildlife habitat by restoring forests and expanding the tree canopy on City-owned land” (City of Seattle, 2016). With planned mitigation, the project would be consistent with this plan.

The Urban Forest Stewardship Plan (City of Seattle, 2013) supports a healthy and regenerative urban forest across Seattle’s public and privately owned lands; maintaining existing trees and planting new trees are priority actions. Although the removal of existing mature trees is not consistent with this plan, the replanting of trees is consistent with the plan.

The Landscape Management Plan (Seattle Center, 2009) outlines a management philosophy and framework for Seattle Center’s landscape and outdoor spaces. It aims to retain legacy or dedicated trees

when possible, but they can be removed with approval from the Director of Seattle Center. With planned mitigation, the project would be consistent with this plan.

Alternative 2: Modified Proposal

Alternative 2 would likely require the removal of 5 exceptional, legacy, and/or street trees. The north end of the arena would be redesigned to avoid removal of the 2 legacy trees in the International Plaza that would be removed under Alternative 1. However, the roots of these trees may be compromised from foundation construction, which could ultimately kill the trees. Additionally, open-cut method would not be used to construct the loading dock access tunnel; thus, the trees on Thomas St would not be removed. However, their roots may be impacted by tunneling. As with Alternative 1, 3 trees would be removed for driveways: 1 legacy tree on Thomas St would be removed for construction of the entrance to the underground parking garage, 1 legacy/street tree on John St for the relocated driveway to the 1st Ave N parking garage; and 1 street tree on 1st Ave N for the loading dock access tunnel driveway. The trees removed on John St and 1st Ave N would be different from Alternative 1 because the driveways are in different locations. As with Alternative 1, 2 legacy/street trees would likely be removed on the north side of Thomas St between Warren Ave N and 2nd Ave N for construction activities. As with Alternative 1, all existing landscaping, shrubs, and trees larger than 6-inches diameter at breast height that are not exceptional, legacy, or street trees on the arena parcel of the project site would be removed (approximately 60 trees).

12.4.2 Operations Impacts

This section describes potential operations impacts to trees from the proposed Seattle Arena Renovation Project. Potentially significant impacts are defined below. Impacts that do not reach this threshold would be less-than-significant.

Criteria for Significant Operations Impacts: An impact would be significant if it resulted in a permanent loss of exceptional, legacy, dedicated, or street trees or other vegetation that cannot be mitigated.

No Action Alternative

No impacts are expected to plants (trees) from operation of the existing KeyArena under the No Action Alternative.

Alternative 1: OVG Proposal and Alternative 2: Modified Proposal

Trees removed during construction would be replaced at a ratio of at least 2:1 as described above. However, there would be a temporal loss of tree canopy from the removal of mature trees and replacement with younger, smaller trees. Tree canopy would be replaced over time as replacement trees mature.

The operational impacts under Alternative 2 would be similar to Alternative 1, except that effects on tree canopy would be less.

12.5 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

12.5.1 Construction

Alternatives 1 and 2

Trees will be protected to the greatest extent practicable during construction by following the protection measures outlined in DR 30-2015 and the Street Tree Manual (SDOT, 2014). A Tree, Vegetation, and Soil Protection Plan could be developed for the project. Mitigation for tree removal includes tree replacement at a 2:1 ratio as required by EO 03-05 (Tree Replacement). Historic markers may be installed to recognize the legacy of the removed trees, and steps may also be taken to preserve other legacy trees on the campus.

12.5.2 Operations

Alternatives 1 and 2

A landscape plan would be developed in coordination with Seattle Center, and the landscape design for the project would be consistent with the Seattle Center Landscape Management Plan (Seattle Center, 2009). Over time, tree canopy would be replaced as new planted trees mature.

12.6 SIGNIFICANT AND UNAVOIDABLE ADVERSE IMPACTS ON PLANTS

There would be no significant and unavoidable adverse impacts to plants.

13.0 CUMULATIVE IMPACTS

This chapter evaluates and summarizes the potential cumulative impacts of the project alternatives. Cumulative impacts are impacts that could result from the incremental consequences of an action (in this case, the project alternatives) when added to other reasonably foreseeable future actions. When impacts of an action are viewed individually, they may appear minor, but when considered collectively (cumulatively) with the impacts of other actions (especially over a period of time), the impacts can be more significant. The purpose of the cumulative impacts analysis is to ensure that decision-makers consider the full range of consequences for the proposed project, including the project's incremental contribution to cumulative impacts on the environment. The analysis includes only the elements of the environment for which cumulative impacts occur.

13.1 REGULATORY CONTEXT

SEPA directs lead agencies to consider the direct, indirect, and cumulative impacts of proposed actions. This cumulative impact analysis is prepared in accordance with SMC 25.05.670, SEPA (RCW 43-21C), the SEPA Rules (WAC 197-11-060 and 197-11-792), and the SEPA Handbook (Ecology, 2003).

13.1.1 Methods

This analysis provides a broad assessment of potential cumulative impacts related to implementing the project. An array of other past, present, and reasonably foreseeable future actions near the project site were reviewed. The cumulative impact analysis used the following approach:

- Identification of geographic boundaries (i.e., the study area). The preceding chapters of this Draft EIS describe the potential impacts of the project on elements of the environment. As described in those chapters, the study areas are the areas where the project has the potential to affect elements of the environment. In general, the study areas include the project site and surrounding areas. The cumulative impact assessment uses the same study area, for each element of the environment, as the study areas represents the area where the project, in combination with other past, present, or reasonably foreseeable future actions, could result in cumulative impacts.
- Identification of reasonably foreseeable future projects and actions within the geographic and time-based boundaries.
- Analysis of the cumulative impacts of these reasonably foreseeable future projects and actions together with the direct and indirect impacts of the project.

13.1.2 Reasonably Foreseeable Future Projects

Reasonably foreseeable future major construction and development projects in the vicinity of the project that are known or are projected to occur during approximately the same time frame as the proposed project were considered in this cumulative impact analysis and are summarized below. The projects considered include both public and private projects. The Seattle Center Arena Renovation

Project is in an area that is rapidly growing, and it is difficult to project future developments and redevelopments with accuracy.

A number of transportation improvements and projects were considered as part of the transportation analysis included in Chapter 4, *Transportation*. Additional detail on roadway, pedestrian, bicycle, and transit projects considered for the transportation analysis are included in Appendix C, Tech Memo #3 (*Year 2020 & 2035 Background Transportation Network*). Some major projects, such as the extension of LINK light rail north to Lynnwood Transit Center and the Ballard to West Seattle extension, will affect transportation impacts and are described in Chapter 4, *Transportation*.

- Alaskan Way Viaduct Replacement Project. SR 99 tunnel open to traffic with tolls, Alaskan Way Viaduct would be closed and demolished, and Alaskan Way/Elliott Ave W surface streets would be reconstructed.
- "Reknitting" or reconnection of surface streets across SR 99, including Harrison St, Thomas St, and John St.
- Waterfront Seattle.
- Expedia Campus Major Phased Development.
- Redevelopment activities at the Seattle Center campus, including potential modifications to Memorial Stadium, potential construction of a new high school facility, and potential renovations to the KCTS 9 site.
- LINK light rail extended north to Lynnwood Transit Center and Ballard, west to West Seattle, and east to Redmond. Includes a station near Seattle Center.

In addition, new residential and commercial development in Uptown, Belltown, and South Lake Union may occur in the same or near timeframe. At the time of Draft EIS preparation, 4 permit applications were listed in the SDCI permit tracking system for proposed large apartment or condominium buildings within 2 blocks of the project site.

None of the above activities are functionally related to the project (i.e., one could proceed without the other). Each of the projects would be required to conduct separate, project-specific SEPA environmental review, as appropriate. Mitigation measures for each project would decrease the potential for cumulative impacts.

If any of these projects were constructed at the same time, there is a potential for a cumulative impact, but the impact would only be during construction and temporary for the duration of the construction activity.

Construction management of the Seattle Center Arena Renovation Project would include coordination with other developments to reduce the potential cumulative construction impacts on neighboring residents and businesses.

There are no cumulative impacts associated with the No Action Alternative for any element of the environment. Potential cumulative impacts would be the same for Alternatives 1 and 2, as described below. Only those environmental elements with cumulative impacts are described.

13.2 LAND USE

During construction, there may be indirect impacts to nearby properties and businesses from the loss of on-street parking, construction noise, and construction traffic. These disturbances, concurrent with other construction projects in the study area, would create intermittent inconvenience to businesses and residents that could ultimately contribute to some residents or business patrons deciding to leave the area, or businesses deciding to relocate.

Both action alternatives would increase the frequency of major events, resulting in a greater number of visitors during the year to the Seattle Center Arena, Seattle Center campus, and neighboring areas. This could make the area more attractive to sports and entertainment-related businesses, but could make it less attractive for businesses not associated with sports or entertainment.

The potential for more parking and traffic congestion would be cumulative with the increased development density planned for in the Uptown and surrounding neighborhoods. This could be seen as a positive or negative quality of life impact, depending on the perspective of the residents in Belltown, Uptown, and South Lake Union.

Surrounding businesses may see an increase in demand for services as a result of the increase in frequency of programming and subsequent number of visitors during the year. Businesses that could experience increased demand based on the increased frequency of events include nearby restaurants, coffee shops, and retail uses. This could be seen as a positive or negative impact, depending on the perspective of existing businesses in Belltown, Uptown, and South Lake Union.

13.3 TRANSPORTATION

Chapter 4, *Transportation*, includes analysis of both a 2020 and 2035 scenario, which includes trips and parking demand from other anticipated development in the study area. The Transportation analysis presents the results of a cumulative analysis. See Section 4.4, *Potential Impacts*, for details. In general, increased vehicle trips associated with event attendees at the renovated arena would add to congestion on area streets, resulting in significant impacts to traffic operations.

13.4 HISTORIC AND CULTURAL RESOURCES

The increased frequency of events associated with the Seattle Center Arena Renovation Project alternatives could cumulatively contribute to accelerated change in the character of adjoining neighborhoods, as the area undergoes a transition toward higher density development, and existing, older buildings are demolished and replaced.

13.5 NOISE AND VIBRATION

Noise from construction of the project would contribute to an already noisy environment, including construction activities from other projects if they occur nearby. Noise analysis is by nature cumulative; higher ambient noise levels affect how new noise is perceived. Overall, the Seattle Center Arena

Renovation Project would contribute to a noisier environment caused by sports fans, amplified outdoor broadcasts, and a higher level of activity prior to and following events.

13.6 VISUAL RESOURCES

Increased lighting associated with signage would contribute to higher levels of lighting in Uptown, as the area increases in density and businesses install signage and outdoor lighting.

13.7 AIR QUALITY AND GHG EMISSIONS

Cumulative impacts on air quality would be related to short-term increases in construction activity associated with the project along with other proposed construction projects in the area. Cumulative impacts on GHG emissions would result from the operation of the renovated arena. Long-term cumulative increases in traffic volumes, vehicle miles traveled, and congestion would result from the increased number of events and from future growth in traffic from other future projects in the area. The increased vehicular traffic associated with the greater number of events at the renovated arena would contribute to GHG emissions from background traffic in the area that is also expected to increase, which would cumulatively contribute to inconsistency with the City's GHG reduction goals. Near Seattle Center, air pollution emissions could increase from vehicular traffic diverted by tolling the new SR 99 tunnel, Waterfront Seattle, and new residential and commercial development in Uptown, Belltown, and South Lake Union, although over time, improvements in vehicle emissions should reduce most air pollutants from vehicles.

13.8 PUBLIC SERVICES AND UTILITIES

Renovation of the arena and associated increased number of events would contribute to the general trend of increased demand on public services and utilities throughout the city. These increases, along with congestion associated with other proposed developments, could create congestion-related delays for emergency vehicles.

13.9 PLANTS

The removal of large trees may contribute to an overall temporal decrease in canopy cover that has been occurring in the city as the result of development.

14.0 DISTRIBUTION LIST

The following parties have received copies of the full Draft EIS:

Tribal Governments

Duwamish Tribe

Muckleshoot Indian Tribe

Snoqualmie Tribe

Stillaguamish Tribe

Suquamish Tribe

Tulalip Tribes

Regional

Puget Sound Air Pollution Control Authority (PSAPCA)

Puget Sound Regional Council

Sound Transit

Washington State

Department of Archaeology and Historic Preservation

Department of Ecology SEPA Register

SEPA Public Information Center

Libraries

Central Branch

Queen Anne Branch

Local

King County Executive's Office

King County Metro Transit

King County Wastewater Treatment Division

Seattle Center

Seattle City Council Legislative Department

Seattle City Light

Seattle Department of Construction & Inspections

Seattle Department of Neighborhoods, Historic Preservation Program

Seattle Department of Parks and Recreation

Seattle Department of Transportation

Seattle Design Commission

Seattle Fire Department

Seattle Law Department

Seattle Office of Economic Development

Seattle Office of the Mayor

Seattle Public Schools

Seattle Public Utilities

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