APPENDIX A – SECTION 14

SUMMARY

A. APPROACH

This study spent eight months (June 2019 through January 2020) objectively and independently evaluating and assessing readily available existing data to determine the extent of effects – positive, negative, and neutral – associated with the operation of Seattle-Tacoma International Airport. Data was reviewed for the period 1997 to 2019, with three milestone years of interest:

- **1997**
  This year was selected because data was available from the 1997 study that examined similar issues for a nearly identical area (the city of SeaTac was not part of the 1997 at that time).

- **2009**
  This was the first full year of operation of Runway 16R/34L (the third runway), a controversial expansion of the airport's capacity, which was ultimately approved and constructed. 2009 was also affected by a significant recession that affected the U.S. If operations and/or economic activity decreased due to a decrease in commercial flights (business and pleasure), 2009 would most likely reflect that.

- **2019**
  This was considered as the "present year" for most evaluations (a few were in 2018 due to the way data was originally collected).

As stated on page 1 of this study, it acknowledges that Seattle-Tacoma International Airport is a significant regional and statewide asset, and the study takes no sides – it does not argue for or against the airport, nor does it advocate for any city, neighborhood, organization, or resident. Rather, it asked the following two questions central to the 2020 study:

- Do the cities that comprise the study area – Burien, Des Moines, Federal Way, Normandy Park, SeaTac, and Tukwila – enjoy any benefits by being close to Seattle-Tacoma International Airport?
- Do the cities that comprise the study area shoulder a disproportionate burden because of their location close to Seattle-Tacoma International Airport?

From 1997 to 2019, the Seattle region experienced significant growth, roughly doubling in population. The consultant team attempted to determine which effects resulted from natural organic regional growth (induced effects), and which were directly related to Seattle-Tacoma International Airport operations (direct effects). In some cases, it was not possible to differentiate between effects that were the result of airport operation and those related to regional growth.

B. THE STUDY AREA CITIES

It is important to appreciate the unique characteristics and qualities of each of the cities that comprise the study area. While referred to collectively as the study area cities, each is unique and may experience effects to a greater or lesser extent:

- **Burien**
  Burien is west and northwest of the airport and is predominantly a residential community, but also has a strong commercial corridor (First Avenue South), a revitalized mixed-use downtown area, and Puget Sound views. It shares most of its eastern border with Seattle-Tacoma International airport and has previously raised issues with airport operations, including the 1997 study and winning a 2019 lawsuit the challenged the 250-degree turns with overflights above the city.

- **Des Moines**
  Des Moines is located predominantly south of the airport and is also a mostly residential community with a strong commercial corridor (U.S. Highway 99). Unique to the study area cities, Des Moines has a downtown district adjacent to Puget Sound. Most of the northern border of Des Moines abuts Seattle-Tacoma International Airport.

- **Federal Way**
  Federal Way is south of the airport and is the largest of the study area cities (40.8% of the study area population and 36.7% of its land area). Federal Way has a larger mix of land uses, with a concentration of retail and commercial uses along U.S. Highway 99 and at the intersection with South 312th Street. While it has no direct border with Seattle-Tacoma International Airport, residents reported concerns with south flow overflights.

- **Normandy Park**
  Normandy Park is west of the airport and is the smallest of the study area cities (approximately 2.8% of the study area population and 4.1% of its land area). It is mainly a single-family residential community with a small retail center at First Avenue South and Southwest 200th Street. Normandy Park shares no common border with Seattle-Tacoma International Airport but has voiced concerns with overflights.

- **SeaTac**
  The city of SeaTac has perhaps the most unique relationship with Seattle-Tacoma International Airport. While sharing a very similar name, it also surrounds the airport and has strong commercial ties to airport activity – specifically hotels, off-airport parking lots, retail and dining – with direct roadway and pedestrian access to the airport via U.S. Highway 99. It also provides direct access from IH-5 via South 188th Street. Upwards of SeaTac's city limits include airport land, making the remaining non-airport acreage more densely developed.

- **Tukwila**
  Tukwila is east and north of Seattle-Tacoma International Airport and shares no common border with the airport. Tukwila spans both sides of IH-5 and is home to a major retail center (Westfield Southcenter Mall and surrounding retail), numerous hotels, office and warehouse/distribution centers, in addition to established residential neighborhoods. Tukwila is also the closest study area city to two other nearby airports – Boeing Field/King County International Airport and Renton Municipal Airport.

Two of the study area cities – Tukwila and SeaTac – are served by Sound Transit Link Light Rail, which is also proposed to extend south into Des Moines and Federal Way (and further into Tacoma and Pierce County). While Burien and Normandy Park are not currently served by any light rail transit system, a future Bus Rapid Transit (BRT) line is proposed to connect to Lynnwood (proposed to start in 2024).

The study area cities span many economic and demographic groups, affluent to low income, a wide variety of ethnicities and ages, and many other unique qualities. One area of commonality is that they all have airport committees composed of local citizens who advise the city councils on local issues and concerns surrounding Seattle-Tacoma International Airport.

The 2020 study does not uniformly represent the study area as monolithic. There are nuances and distinctions unique to each city that must be considered prior to initiating or adopting any recommendation contained herein.

While not technically a "city", the unique characteristics of Seattle-Tacoma International Airport are also important considerations in the 2020 study. The 2020 study recognizes the airport's role as a member of the local, regional, and statewide economy, as well as a significant employer – not only those who work for the Port of Seattle, but those who work for the airlines, concessionaires, and vendors and service professionals who support the airport. Seattle-Tacoma International Airport is also an important part of the region's business and tourism industries.

Seattle-Tacoma International Airport, the Port of Seattle, and the Federal Aviation Administration have been the focus of numerous concerned citizens over many years. The airport is surrounded by urbanized development and has little room for expansion. This is not an unusual relationship, and the 2020 study reviewed three comparable airports (Boston, Miami and Phoenix) as case studies. There are many more U.S. (and international) airports with similar urban relationships, and any follow-up studies should conduct a wider inventory of these facilities.

C. WHAT WE HEARD FROM THE PUBLIC

The consultant team sought public input through a variety of methods – a technical advisory committee; a series of in-depth interviews with study area stakeholders (1-to-1 and in small groups); and public presentations in Tukwila and Burien.

Public input helped the consultant team identify what the study area felt were the most pressing concerns. When members of the public provided additional data and documentation, it was independently verified before being integrated into the 2020 study by the consultant team. Information and data that could not be validated was used to help reinforce anecdotal evidence of community concerns.

Noise was the most-often mentioned issue with operations at Seattle-Tacoma International Airport. A close second were concerns regarding **air quality** resulting from aircraft operations (affecting health, landscaping, etc.). Other concerns raised by the public included:

- Failure of mitigation packages as part of the third runway mitigation process
- Traffic congestion, specifically on airport Expressway, along International Boulevard/U.S. Highway 99 at Arrivals Drive/South 182nd Street, on State Route 518 westbound (west of the I-5/I-405 interchange), and State Route 518 eastbound (west of the Des Moines Memorial Drive interchange)
- Concerns that South King County is a "dumping ground," noting the development of the Federal Detention Center (2425 South 200th Street) and the Federal Aviation Administration Flight Standards District Office (2200 South 216th Street) – neither of which contributes property tax revenues to the local communities.
- A mistrust by some members of the public of the Federal Aviation Administration, the Port of Seattle, and Seattle-Tacoma International Airport. This level of skepticism appears to most acute in Burien, Des Moines, Federal Way, and Normandy Park.
- Violent crime, property crime, and motor vehicle theft in the study area cities is disproportionate.

- Property crime activity in the study area cities is disproportionate.
- Motor vehicle theft and related activity in the study area cities are disproportionate.
- Homelessness is a regional problem and is pervasive near the airport.
- Airport proximity influences health statistics.
- Airport proximity exceeds appropriate health standards.
- There are noise-induced health concerns.
- Port programs and other efforts (sustainability and fly quiet) have been ineffective.
- Previous noise mitigation packages are ineffective.
- The relationship with the Port is generally poor, but also varies by community.
- Airport revenues are not shared with South King County communities.
- The most vulnerable groups are being the most adversely affected.
- Positive and negative effects vary among the study area cities.
- Housing most adversely affected is near the airport.
- School performance has suffered due to airport effects.
- The Port of Seattle is not responsive to the cities in the study area.
- NextGen procedures have enhanced adverse effects.
- Airport employment levels for area residents are not what they used to be.

It is important to appreciate the fact that the study area cities do not speak with a single voice and experience effects to different degrees. For example, Burien, Des Moines, Federal Way, Normandy Park and portions of SeaTac immediately north of the airport tended to identify concerns with noise and aircraft overflights more frequently. So even when the 2020 study refers to "the study area cities," these communities are not uniform or monolithic – each has unique issues, proximity to the airport, and other externalities.

D. EFFECTS ON THE STUDY AREA

Noise and vibration effects

- **Positive effects of noise and vibration**
  There are no known positive results of receiving noise or vibration.
- **Neutral effects of noise and vibration**
  There are no known neutral effects of noise or vibration. (There is a large data gap related to evaluating vibration effects resulting from operations at Seattle-Tacoma International Airport. More information and monitoring is required to identify effects directly attributable to aviation activity.)
- **Negative effects of noise and vibration**
  The 2020 study finds that noise has been directly affecting most of the study area since the baseline year of 1997. The airport's growth in operations and passengers since 2000 has also resulted in increased noise complaints. And NextGen procedures have concentrated flight patterns over a tighter airspace, resulting in a higher concentration of flights in a smaller area. Negative effects associated with noise include annoyance, sleep disturbance, cardiovascular effects, children's learning and cognitive impairment, speech interference, depressed property values and effects on wildlife and domestic pets.

- **Data gap: noise and vibration**
  The 2020 study did not find sufficient data to evaluate the effect of vibrations in the study area between 1997 and 2019. This is a metric that warrants additional analysis and data collection/monitoring.

Air quality effects

- **Positive effects on air quality**
  There are some positive aspects of air quality:
  - Air quality is technically in attainment in King County, but this may be a misleading statement because the air quality monitoring and sampling network is not completely operable and is not close to Seattle-Tacoma International Airport.
  - Toxic emissions are showing a downward trend
  - Seattle-Tacoma International Airport has adopted emissions reduction initiatives and has a goal to power all flights fueled at Seattle-Tacoma International airport with a minimum of 10% blend of sustainable aviation fuels (SAF) by 2028.
- **Neutral effects on air quality**
  Despite some positive gain as described above, air quality concerns remain, including the aforementioned limited number of airport-area air quality monitors and concerns about the lack of monitoring and regulation of ultra-fine particles (UFPs). Since these are not yet known to have positive or negative effects, they are listed as neutral in the 2020 study and are recommended for further study and analysis.
- **Negative effects on air quality**
  Air quality concerns include:
  - Unknown effects associated with UFP pollution
  - Effect on air quality as a result of increased operations
  - Black carbon emissions from aircraft.
- **Air quality data gaps**
  There are numerous data gaps in the air quality analysis that require further study:
  - $PM_{2.5}$ are regulated but not UFPs, which may cause health concerns. And follow-up UFP studies were not available or complete at the completion of the 2020 study.
  - Lack of access to EDMS versus AEDT data for comparison. U.S. EPA was unable to provide 2014 data using AEDT to do a complete "apples to apples" comparison.
  - 2016 emissions versus 2017 NEI emissions – There are different input factors as outlined above. However, there is not sufficient evidence to confirm that one method is more accurate than the other. To definitively determine whether one dataset is more representative, an in-depth review of all AEDT input parameters is required. The consultant team does not have access to that information at this time.
  - A dated environmental effect statement (2006) is no longer consistent with actual airport operational data.
  - Toxic concentration information is not based on close-in monitoring data.

Mobility effects

- **Positive effects on mobility**
  - The 2007 addition of Airport Expressway provides direct and free-flowing access to Seattle-Tacoma International airport, but there are instances when traffic becomes congested due to a

variety of factors. The remainder of the study area's ground transportation network has tended to focus improvements for transit access rather than car and trucks.

- The study area mobility improvements since 1997 have favored transit modes, including direct airport transit access via light rail. Other study area network transit-related improvements include park and ride lots and garages, bus pull-offs, transit and HOV lanes, and preferred ramp entry lanes.
- Parking capacity at Seattle-Tacoma International Airport has expanded through the relocation of the rental car outlets to an off-site consolidated car rental facility (2010) which freed up around 3,000 parking spaces in the main parking garage. Airport employees are provided dedicated parking at the North Employee Parking Lot (4,777 parking spaces), the South Employee Parking Lot (1,091 parking spaces), and 766 employee dedicated spaces in the main parking garage.
- Bicycle network improvements include racks for locked bicycle parking in and around Seattle-Tacoma International Airport. However, bicycle access remains a small percentage of how people access the airport.
- Pedestrian facilities are generally limited to sidewalks and signalized crosswalks and a skybridge that connects directly to the airport light rail station. As with bicycle, pedestrian access is a small percentage of how people access the airport.

- **Neutral effects on mobility**
  - On-demand rideshare and shuttle services (e.g., Lyft and Uber) reduce the need for airport parking but may also contribute to traffic congestion accessing the terminal.
  - Private airport parking lots divert traffic from the main parking garage, but also rely on shuttle buses to take customers to and from the terminal.
  - The new cell phone lot provides a temporary waiting area for those picking up arriving passengers, but also adds northbound traffic onto U.S. Highway 99.

- **Negative effects on mobility**
  - Most changes to the roadway infrastructure since 2000 have favored transit and multimodal infrastructure, with little increase in the capacity of the area's roadway and highway network.
  - Average vehicle delays have increased and roadway level of service (LOS) ratings have worsened since 1997. In some of the most significant locations, there has been an average increase of 85% in vehicle delay, and LOS has worsened by one to two levels.

- **Mobility data gaps**
  The 2020 study listed numerous areas where data was either inconsistent or unavailable to make further determinations on the effects of aviation activity on mobility. These included a variety of analyses of users of parking garages, origin/destination studies, and other similar recommended studies.

Surface water quality effects

- **Positive effects on surface water quality**
  The actions of the Port in the Seattle-Tacoma International Airport and surrounding vicinity have improved water quality and the receiving waters' habitat conditions from what they were before. The review of the activities and conditions on surface water quality and habitat conditions has found that the Port of Seattle has been responsive to the effects that Seattle-Tacoma International Airport has had the potential to incur on water quality and aquatic habitats downstream of the airport.

- **Neutral effects on surface water quality**
  There are no known neutral effects on the surface water system.

- **Negative effects on surface water quality**
  There are few negative effects on surface water quality. Effluent levels are usually below the State water quality criteria, but the airport is still a contributor of pollutants, and occasionally exceeds those criteria, despite best management practices and treatments. Such violations, even short-term ones, could affect fish habitats and increase pre-spawning mortality rates in Miller and Walker Creeks, Des Moines Creek and throughout the Puget Sound region.

Groundwater and soil effects

- **Positive effects on groundwater and soil quality**
  The Port of Seattle has remediated known listed on-airport polluted and contaminated sites, including leaking underground storage tanks.
- **Neutral effects on groundwater and soil quality**
  There are no known neutral effects on the groundwater and soil systems, with no changes to the soil or geological framework during the study period (1997 to 2019).
- **Negative effects on groundwater and soil quality**
  - The 2020 study lists several off-airport sites that are polluted/contaminated due to leaking underground storage tanks, but these are not the responsibility of the Port of Seattle.
  - The consultant team heard numerous study area residents who complained of a "black soot" on homes, yards, decks, pools, and vehicles that they attribute to air pollution that has settled on their property. The composition and potential source(s) of the "black soot" has not yet been independently verified, so the 2020 study cannot determine that it is a negative effect directly attributable to aviation activity.
  - The long-closed former Asarco Tacoma Smelter may still have lingering issues, having operated for almost 100 years, depositing air pollution over a 1,000-square-mile area. While of environmental concern, this contamination is not attributed to aviation activity.

Light effects

- **Positive effects from light**
  Seattle-Tacoma International Airport is replacing older-generation lighting with energy efficient LED fixtures that are more controllable, use less energy, and reduce glare and skyglow.
- **Neutral effects from light**
  There are no known neutral effects from the lighting in and around Seattle-Tacoma International airport. This was also not an issue that mentioned by study area citizens as a significant concern.
- **Negative effects from light**
  There are no known negative effects from the lighting in and around Seattle-Tacoma International Airport. This was also not an issue mentioned by study area citizens as a significant concern.

Public safety effects

- **Positive effects on public safety**
  - Incidents of motor vehicle thefts have generally declined in the study area over the past two decades.
  - Among the three major criminal categories investigated in the 2020 study (violent crime, property crime and motor vehicle theft), 2018 figures were lower than 1997 figures in the study area cities except Normandy Park and Tukwila.
  - However, positive effects are inconclusive because they appear to be the result of national trends, rather than a result of airport action or activity.

- There was insufficient data to analyze human trafficking and drug trafficking at the local level. As these are global problems, there is insufficient data to prove a causal relationship to Seattle-Tacoma International Airport.

- **Neutral effects on public safety**
  - Despite reports of, on average, one vehicle per day being stolen from the consolidated rental car facility, motor vehicle thefts in Tukwila have historically exceeded those in the city of SeaTac. The number of motor vehicle thefts in all of the study area cities (except Normandy Park) were lower than those for King County in 2009 and again in 2018, with the exception of the cities of SeaTac and Tukwila.
  - Property crime rates in Tukwila that have historically exceeded those in all of the other study area cities are considered more attributable to the presence of the Southcenter Mall than the airport.
  - Neutral effects on violent crime, property crime, and motor vehicle theft are inconclusive because trends seem to be associated with non-airport influences. There was also insufficient data to analyze human trafficking and drug trafficking at the local level.

- **Negative effects on public safety**
  - The crime rate in the study area cities (except for Normandy Park) is generally higher than the average crime index, but the data varies greatly from city to city, and the data did not prove that this was due to aviation activity.
  - Violence rates among the study area cities have increased in all but Tukwila and SeaTac since 2016.
  - Figures for violent crime in the study area cities in 1997 were higher than the number for King County in 1997 and 2009, with the exception of Normandy Park, as well as in 2018 with the exception of Burien and Normandy Park.
  - Figures for property crime in the study area cities were higher than the number for King County and the state of Washington in 1997. In 2009, they were lower in the cities, but higher than state figures in all but Des Moines and Normandy Park. In 2018, the city figures were again lower than county figures, but higher than state figures in Federal Way, SeaTac and Tukwila.
  - Negative effects on violent crime, property crime, and motor vehicle theft are inconclusive because trends may also be associated with non-airport influences (opportunity, economic, etc.).
  - There was insufficient data to analyze human trafficking and drug trafficking at the local level. As these are global problems, there is insufficient data to prove a causal relationship to Seattle-Tacoma International Airport.

- **Public safety data gaps**
  Information regarding the indicators for which there was either a lack of data, incomplete data, or data that was unavailable at the municipal level includes:
  - Motor vehicle vandalism data at either the county or municipal level.
  - Crime indices for either county or state level.
  - Human trafficking and illegal drug trafficking data at either the county or municipal level.

Public health effects

- **Positive effects on public health**
  There are some national trends that have positively affected public health. Nationally, figures for the leading causes of death – cancer, heart disease, and respiratory disease – have been in decline.

However, there are no indicators that were investigated by the 2020 study that indicate any positive public health effects as a result of aviation activity.

- **Neutral effects on public health**

  The array of diverse health metrics makes it difficult to assign a neutral value on public health effects to any one source. And there are no indicators that were investigated by the 2020 study that indicate any neutral public health effects as a result of aviation activity.

- **Negative effects on public health**

  Negative aspects of public health affecting the study area cities include:

  - The leading causes of death in the study area cities have been and continue to be cancer and heart disease.
  - Between 2012 and 2016, the rate of suicides also increased in the study area cities (except in Tukwila).
  - Among the study area cities, Burien, SeaTac and Tukwila were the highest in total factors contributing to adverse health conditions among women and children.
  - Access to medical care and services among study area residents worsened across nearly every indicator, with figures related to a lack of access to care and preventive services increasing.
  - There was an overall increase in poor health habits between 2012 and 2016 in the study area.
  - Many of these poor health outcomes may also be attributable to a variety of influences: income level, genetic or family pre-dispositions to certain conditions, poor health habits, etc. While poor health can have a devastating effect on individuals and families, there is no current data that indicates it is attributable to aviation activity at Seattle-Tacoma International Airport.
  - There are reports reviewed by the 2020 study – including the NJIT and University of Washington studies – that point to airports as areas of concern for certain pollutants (such as UFPs). It is recommended that this type of research continue, and if possible, be conducted in and around the study area.

- **Public health data gaps**

  Available public health data was not always available by individual study area city. Data had been combined for the cities of Des Moines and Normandy Park, and for SeaTac and Tukwila, making comparisons at the municipal level impossible. Public health information would also be improved if gathered at a finer grain – address, neighborhood, census tract, or enumeration district.

Socio-economic effects

- **Positive effects on socio-economic metrics**

  - Seattle-Tacoma International airport is a source of employment for residents in the study area cities (30% of the area labor force, and 45% of total employment).
  - Revenue from hotel rooms and supporting businesses in the vicinity of Seattle-Tacoma International airport, along with established agreements between the Port and host communities, has a significant, yet disproportionate economic effect. Study area cities benefiting from hotel revenue the most are SeaTac and Tukwila, followed by Des Moines and Federal Way (there were no known hotels in the cities of Burien or Normandy Park).
  - Proximity to air service provides a locational advantage for companies within a 30-minute drive of Seattle-Tacoma International Airport – particularly those also served by the commercial elements of an urban center.
  - Seattle-Tacoma International Airport provides a regional advantage addressing the travel needs of business and leisure travelers and visitors. It also enables the efficient movement of people and goods across distances, strengthening ties between communities, regions, and

countries and encouraging economic growth. It also plays an integral role in shipping time-critical and high-value cargo.

- **Neutral effects on socio-economic metrics**
  - Burien and SeaTac maintain the oldest housing inventory among the study area cities.
  - With the exception of Normandy Park, all of the study area cities have lower median home sale prices than the Seattle Metro area.
  - Multi-family vacancy rates in the study area cities are lower than King County, except in Des Moines and Burien. Average monthly multi-family rents in the study area cities are all lower than King County's rate, and only Tukwila's rate grew at a rate higher than King County.
  - Study area communities farthest from Seattle-Tacoma International Airport are considered relatively more valuable, commanding higher rental rates and absorbing space at a higher rate.
  - All study area cities have commercial vacancy rates below equilibrium, a consistent trend being experienced in many cities since the Great Recession.
- **Negative effects on socio-economic metrics**
  - Study area school districts reported a "lower socio-economic profile" than King County. These districts have performed at comparatively lower levels in math and the arts than statewide levels as a whole. (Conversely, districts located to the north of the study area – Seattle, Shoreline, Northshore, and Bellevue – have performed at higher levels than statewide levels as a whole, over that same time period.)
  - All study area cities (except Normandy Park) have lower median household incomes below the average for King County, and in most instances lower than the state average.
  - With the exception of Normandy Park and Des Moines, all study area cities have higher shares of owner-occupied households spending 30% or more of their income for housing.
  - Over the past two decades, unemployment rates in the study area have increased, while King County's unemployment rates have decreased.
- **Socio-economic data gaps**
  - Small business growth data at either a municipal or county level
  - Wage information at a municipal level (compounding difficulties related to wage information was the lack of information regarding actual job types held by residents in the study area cities at the airport or its affiliates.)

E. EFFECTS ATTRIBUTABLE TO AVIATION ACTIVITY

Figure 14.1 presents a general assessment of the all of the effects in the study area attributable to aviation activity, categorized into four effect types:

- Positive effect attributable to aviation activity
- Negative effect attributable to aviation activity
- Neutral or no effect attributable to aviation activity
- Inconclusive data/needs additional study.

Various data gaps and limited information inhibit the ability to determine the effect aviation activity has on the study area. There are numerous data gaps that have been identified in the 2020 study that are recommended for additional study and analysis.

Figure 14.1
Summary of Study Area Effects Attributable to Aviation Activity – 1997 to 2019

■ Positive effect attributable to aviation activity
■ Neutral/no effect attributable to aviation activity
■ Negative effect attributable to aviation activity
○ Inconclusive data/needs additional study

METRIC	STUDY AREA CITY																	
	Burien			Des Moines			Federal Way			Normandy Park			SeaTac			Tukwila		
	1997	2009	2019	1997	2009	2019	1997	2009	2019	1997	2009	2019	1997	2009	2019	1997	2009	2019
NOISE and VIBRATION																		
Noise	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	○	○	○
Vibration	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Vibration	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
AIR QUALITY																		
CO	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
HC	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
NO_x	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
SO_2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
VOC	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
PM_{10}	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
$PM_{2.5}$	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
UFP's	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
MOBILITY																		
Traffic	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Transit/Rail	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Transit/Bus	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Parking	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	■	■	■
Bicycle	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pedestrian	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
SURFACE WATER																		
Stormwater Runoff	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Floodplains	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Wetlands	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
GROUNDWATER and SOIL																		
Groundwater	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Soil	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LIGHT																		
Light	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PUBLIC HEALTH																		
Cancer	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Heart Disease	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Alzheimer's Disease	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Figure 14.1 (continued)
Summary of Study Area Effects Attributable to Aviation Activity – 1997 to 2019

■ Positive effect attributable to aviation activity
■ Neutral/no effect attributable to aviation activity
■ Negative effect attributable to aviation activity
○ Inconclusive data/needs additional study

METRIC	STUDY AREA CITY																	
	Burien			Des Moines			Federal Way			Normandy Park			SeaTac			Tukwila		
	1997	2009	2019	1997	2009	2019	1997	2009	2019	1997	2009	2019	1997	2009	2019	1997	2009	2019
PUBLIC HEALTH (continued)																		
Chronic Lower Respiratory Disease	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Stroke	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Accidents and External Causes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Suicide	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Life Expectancy	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Maternal and Child Health	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Access to Care	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
PUBLIC SAFETY																		
Violent Crime	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Property Crime	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Motor Vehicle Theft	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Human Trafficking	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Drug Trafficking	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
SOCIO-ECONOMIC																		
Housing	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	■	■	■
Employment	■	■	■	■	■	■	■	■	■	○	○	○	■	■	■	■	■	■
Retail Market	○	○	○	○	○	○	○	○	○	○	○	○	■	■	■	■	■	■
Office Market	○	○	○	■	■	■	○	○	○	■	■	■	■	■	■	○	○	○
Industrial Market	■	■	■	■	■	■	○	○	○	■	■	■	○	○	○	○	○	○
Hotel Revenue	■	■	■	■	■	■	○	○	○	○	○	○	■	■	■	■	■	■
Tax Revenues	○	○	○	○	○	○	○	○	○	○	○	○	■	■	■	○	○	○

F. RECOMMENDATIONS

Seventy recommendations are presented for further consideration as part of the 2020 study.

Noise and vibration recommendations

The following 10 recommendations are offered to address noise and vibration issues (refer to Section 5 of this study for further information):

N.1 ..... Develop a set of alternative noise metrics

The Federal Aviation Administration is encouraged to complete its study of alternative noise metrics for assessing the effect of noise on residential areas. If the metric is not changed, the Port of Seattle should advocate for an alternate metric.

N.2 ..... Increase arrival glideslope

Work with the Federal Aviation Administration to increase the arrival glide slope to a minimum of 3 degrees for all arrival aircraft.

N.3 ..... Conduct an environmental review for flight track changes

Any desired changes in flight tracks should have adequate environmental review and provide opportunities for public involvement.

N.4 ..... Institute noise abatement procedures

The Port of Seattle should consider noise reduction measure for take-off and landing procedures during low traffic and late-night hours. A limit on late-night flights (between midnight and 7 a.m.) should be considered, including both cargo and passenger flights.

N.5 ..... Expand noise monitor locations

The Port of Seattle should consider installing additional permanent and mobile noise monitoring stations to monitor noise in the areas receiving the highest number of complaints. This information would be valuable to understand the extent of noise and to inform current and future mitigation programs.

It is important to note that while the 2020 study was underway, the Port of Seattle Commission voted on Nov. 19, 2019 to adopt Motion 2019-14, which authorized the purchase of five new portable noise monitors. That motion stated that "the determination of the location of the monitors shall be based on community outreach and analysis of coverage of the Port's current noise monitoring system and technical factors and shall include Vashon Island."

N.6 ..... Address existing mitigation packages

There have been numerous reports of faulty installations of sound insulation features on homes within the 65 DNL contour, mostly mitigated during the third runway project. It is recommended that the Port of Seattle accommodate faulty and failed installations and ensure that future installations are inspected to comply with appropriate building codes.

N.7 ..... Direct representation on the Port Commission

The Port of Seattle is governed by a five-member commission, with each commissioner elected at large and serving a four-year term. It is recommended that the Port of Seattle designate one commission position to be directly representative of the study area cities. This "district commissioner" would represent the constituents of the study area cities and would be a resident of the city of Burien, Des Moines, Federal Way, Normandy Park, SeaTac, or Tukwila.

N.8 ..... Conduct additional vibrational monitoring

Residences where the louder SEL events occur (exceeding 75 dB) should include monitoring of the windows, walls and floors for vibration. This monitoring should occur over a longer timeframe (the previous study only evaluated the effects over a 24-hour period).

N.9 ..... Determine SEL effects

Residents living in the vicinity of Seattle-Tacoma International Airport should participate in a panel to rate the annoyance of individual aircraft SEL events in their homes and conduct a statistical analysis to establish the best combination of measures to predict annoyance (using such metrics as the Hubbard Exterior Sound Pressure Level Threshold Criteria).

N.10 ..... Determine the effectiveness of sound insulation practices

The practices and efficiency of the sound insulation techniques authorized by Port of Seattle to limiting LFN in homes and businesses under its Part 150 program should be evaluated for effectiveness. Homes and businesses where current noise mitigation are insufficient or have failed should be replaced with appropriate measures.

Air quality recommendations

The following five recommendations are offered to address air quality issues the issues (refer to Section 6 of this study for further information):

AQ.1 ..... Improve the current monitoring network

Improve the current air quality monitoring network by increasing the number and location of monitors in and around the airport, including measurements of ozone and particulates.

AQ.2 ..... Establish monitoring guidelines for new locations

Establish guidelines for air quality monitor locations that consider economics, security, logistics, and atmospheric and pollution considerations.

AQ.3 ..... Deploy Purple Air monitors

To supplement the above air quality monitor network, deploy a collection of smaller, less expensive monitors (such as those from Purple Air) throughout the study area (100 to 200 monitors, for example) in areas of concern to get a general sample of air quality trends. A quality assurance program should be part of this effort to ensure the monitors are deployed, placed, and maintained correctly. This, in turn, may assist in indicating which areas should receive future FRM/FEM monitor in the future.

AQ.4 ..... Research the connection of ultrafine particles and health effects

Further study and research should be conducted to establish a definitive link between UFPs and health effects.

AQ.5 ..... Aviation emissions rise and effect decline

While there has been regional compliance with air quality standards, EPA data has shown a general increase over the past decade that correlates to a rise in airport operations, especially with a large increase from 2014-2017. Additional study and an improved monitoring network are recommended to determine the extent of regional air pollution directly related to aviation activity.

Mobility recommendations

The following 25 recommendations are offered to address mobility issues, including access via roads, transit, pedestrian, as well as area parking. Many of these recommendations include additional studies and inventories to augment existing data gaps (which is not complete – refer to Section 7 of this study for further information):

M.1 ..... Generate rental car forecasts

The Port of Seattle should work generate annual service demand for rental cars to ensure the consolidated rental car facility can accommodate future customer volumes and vehicle storage.

M.2 ..... Conduct an annual parking demand study

The Port of Seattle should conduct an annual study parking demand and occupancy for the main parking garage and employee parking lots to better assess parking demand and plan for supply over time in the Seattle-Tacoma International Airport parking system.

M.3 ..... Conduct an annual cell phone lot demand study

The Port of Seattle should conduct an annual survey of the cell phone lot usage in terms of occupancy and typical vehicle parking duration. The survey should examine whether the cell phone lot reduces congestion at the arrivals and departures areas in front of the terminal.

M.4 ..... Inventory private parking lot data

The Port of Seattle should create a consolidated list of private parking facilities along with inventory and occupancy data to maintain a record of off-site parking accommodations and how changing supply may increase demand at the main garage. The Port should also identify private

lots that may be redeveloped as other non-parking uses in the near and long-term in anticipation of a parking demand shift.

M.5 ..... Conduct an airport mobility modes survey

The Port of Seattle should analyze the historical and current passenger mode trends to assess how passengers and employees travel to and from the airport. The Port of Seattle should institute annual passenger surveys to forecast and respond to mobility demands.

M.6 ..... Conduct a drop-off/pick-up zone study

The Port of Seattle should create a data source for drop-off and pick-up zones for airport shuttles to assess congestion and vehicle and pedestrian flow in and around the airport property.

M.7 ..... Forecast employee/vendor/tenant demand

The Port of Seattle should work with its staff, vendors, and tenants to generate annual employee forecasts to ensure there are parking and mobility options to accommodate changing employment.

M.8 ..... Develop an airport parking master plan

The Port of Seattle should create a parking master plan based on anticipated passenger volumes and employment forecasts, in collaboration with airport vendors and employees, surrounding cities, King County Metro, and Sound Transit.

M.9 ..... Develop a transportation improvement program database

The Port of Seattle should work with WSDOT, Sound Transit, King County Metro and local planning and/or local economic and development departments to create a database of all historical and current capital improvements in the Seattle-Tacoma International Airport area to better understand how the physical network changes overtime

M.10 .... Conduct a rental car origin-destination study

The Port of Seattle should conduct a vehicle origin-destination study at the consolidated rental car facility to better understand vehicle patterns and movements along the transportation network around the facility, as well as to understand where vehicles are traveling from to reach the facility. This study should conduct an origin-destination analysis for SOVs, transit, shuttles, and airporters.

M.11 .... Develop a targeted annual traffic monitoring system

The Port of Seattle should work with WSDOT and local traffic engineering departments to create an airport-specific traffic monitoring system and program. Critical intersections and roadway segments should be identified and monitored on an annual basis to create a consistent and reliable database that monitors congestion over time. The traffic analysis should target specific time frames to include both off-peak and peak seasons, and a.m. and p.m. peak time periods. Future traffic monitoring efforts should include level of service, vehicle delay, vehicle/capacity ratios, and AADT analyses.

M.12 .... Conduct an annual transit demand analysis

The Port of Seattle, King County Metro, and Sound Transit should participate in an annual transit analysis on ridership, use, perception, and demand in and around the airport. This study should document transit demand in the study area and ways to improve transit ridership to the airport.

M.13 .... Improve airport passenger and employee transit use

The Port of Seattle should partner with King County Metro and Sound Transit to identify annual transit use by airport passengers and employees.

M.14 .... Analyze park and ride Use

The Port of Seattle, King County Metro, or Sound Transit should conduct a detailed analysis of the park and ride facilities in the study area to determine how many people use the facilities to access the airport.

M.15 .... Conduct a park and ride license plate analysis

A license plate analysis should be conducted at park and ride lots to determine where vehicles originate and to better understand park and ride demand patterns.

M.16 .... Conduct an off-street parking license plate analysis

In conjunction with the above, a license plate analysis should be conducted at key off-street parking facilities and neighborhoods to understand where vehicles originate from in the study area and the use of certain on-and off-street facilities.

M.17 .... Conduct a transit origin/destination study

Similar to the above, an origin/destination study should be conducted for key transit centers and hubs in the region to determine which users access the Seattle-Tacoma International Airport via transit modes. An origin/destination study analyzes travel patterns and average daily traffic in a specific study area along key roadways and points to assess where vehicles are traveling.

M.18 .... Conduct annual pedestrian counts

The Port of Seattle, King County Metro, and Sound Transit should participate in an annual pedestrian access study to determine the number of people who use the sidewalk in front of the terminal and the Link Light Rail Airport/SeaTac station pedestrian bridge to access the airport.

M.19 .... Identify and eliminate pedestrian mobility barriers

The Port of Seattle, King County Metro, Sound Transit, and the City of SeaTac should participate in a study to identify potential mobility barriers for pedestrians traveling between the terminal and U.S. Highway 99 (e.g., lack of wayfinding/signage, crosswalk locations, crosswalk signal timing, etc.).

M.20 .... Conduct an on-going on-street Parking study

The cities of Burien, Tukwila, and SeaTac should maintain on-going parking studies with specific emphasis on-street segments adjacent to transit centers, light rail stations, and the Seattle-Tacoma International Airport. The study should monitor supply, use, duration, and areas with excessively high use from non-residents.

M.21 .... Establish existing/baseline conditions

The initial parking studies should document existing conditions of specified off-and on-street parking facilities in the area, in communities including Burien, SeaTac, and Tukwila. Use counts should be conducted in these facilities during peak morning, afternoon, and evening peak periods during a typical weekday and weekend.

M.22 .... Establish and maintain a parking supply database

Develop a database of existing parking facilities, inventory, and use/demand to provide insight on parking demand in the area and give local communities an inventory that can be expanded and monitored over time.

M.23 .... Adopt or expand parking permit programs

Burien and Tukwila should adopt/expand their parking permit programs to discourage long-term airport passenger and employee parking on residential streets. Permit programs should focus on areas close to light rail and RapidRide stations (within a 10-minute walk, or roughly one-half mile).

M.24 .... Parking limitation education at the airport

The Port of Seattle should create an informational program to educate airport employees and passengers regarding local parking restrictions – especially Burien, SeaTac and Tukwila – to

discourage on-street parking on surrounding streets for airport purposes. The Port of Seattle should also post off-airport parking restrictions on the airport webpages, signage in and around the terminal, and through employee information sharing.

M.25 .... Develop employee parking restrictions

The Port of Seattle should adopt a formal policy that prohibits airport employees from using on-street off-airport parking during working hours. The Port of Seattle should educate employees of the policy and adopt enforcement and associated disciplinary measures for violators.

Surface water recommendations

The following three recommendations are offered to address surface water quality issues, involving methods to expand the knowledge of how surface water may be affected in the study area (refer to Section 8 of this study for further information):

WQ.1.... Correct potential errors and data gaps

Correct potential errors in the data to determine if sampling methodology from NPDES permit periods is completely comparable over the 22 years examined. If necessary, a more complete analysis of the NPDES water quality results for all outfalls and all parameters may be required.

WQ.2.... Improve receiving stream data

Establish more permanent monitoring stations downstream and collect a suite of water quality parameters that are collected at outfalls on a schedule that makes results more consistent and comparable.

WQ.3.... Further study air pollution effects on surface water

Conduct independent analyses of citizen-reported pollution samples on surface water locations. Also, develop a better understanding of the toxicity of traffic- and aircraft-related UFPs through further study and analysis.

Groundwater and soil recommendations

The following three recommendations are offered to address effects to groundwater and soils, involving methods to expand the knowledge of how surface water may be affected in the study area (refer to Section 9 of this study for further information):

GW.1.... Conduct independent testing of "black soot"

Incidents of "black soot" in the study area should be reported and tested by an independent third-party laboratory to determine its chemical composition and potential source(s).

GW.2.... Conduct ongoing monitoring and sampling

The Port of Seattle should conduct ongoing groundwater monitoring, sampling, and analysis in several remaining AOMA Unit C1 groundwater monitoring wells for key indicator parameters to be performed on a three-year cycle. Results should be reviewed with groundwater data from the study area municipal water wells.

It is noted that the Port of Seattle's 2008 Groundwater Study and five years of annual monitoring demonstrated that there are no existing groundwater contaminant plumes that migrate off airport property. The Port of Seattle has stated that if any new sites are identified in the future, they will be characterized and monitored according to applicable and relevant environmental regulations.

GW.3.... Coordinate with study area comprehensive plans

Natural systems such as groundwater and soils do not begin or end at city or airport borders. The Port of Seattle cooperatively works with surrounding communities to ensure the ongoing health and preservation of groundwater and soil areas. As study area cities update their individual

specific comprehensive plans, they should coordinate with the Port of Seattle to ensure all parties are adopting plans and policies that do not harm that local and regional environment.

Light recommendations

The following two recommendations are offered to address the effects from lighting in and around the study area (refer to Section 10 of this study for further information):

L.1 ..... Update airport high mast lighting

To reduce glare potential, Seattle-Tacoma International airport should replace the high mast flood lighting with LED sources similar to those used around the terminal aprons, at locations in the cargo area and adjacent to North Loop Road. This may be phased in over a period of time – no longer than five years is suggested.

L.2 ..... Adoption of study area lighting standards

Seattle-Tacoma International Airport and the study area cities should consider implementing coordinated lighting guidelines for development of community-friendly infrastructure. The lighting installations for off-site parking, transit, and the consolidated rental car facility are currently not aligned with industry standards for similar developments within neighborhoods or residential communities. To better support the communities that are directly adjacent to such infrastructure, the study area cities (notably the City of SeaTac) should consider adopting community lighting standards that would establish guidelines for future developments and renovations of existing facilities.

Public safety recommendations

The following four recommendations are offered to address public safety issues in the study area (refer to Section 11 of this study for further information):

PS.1 ..... Expand the study area

Assuming the state determines it valuable to continue this 2019 study, consider both expanding the study area to include investigations in communities located north of Seattle-Tacoma International Airport (across all of the indicators identified herein), and allocating appropriate resources to conduct more detailed analyses of criminal incidents on a neighborhood and area-specific basis (at least in the city of SeaTac and other communities located within a specified distance of the airport).

PS.2 ..... Consider an airport overlay district

This concept will be picked up again in a later section, but as it relates to public safety, consider establishing an airport overlay district that both shares in revenues and expenses associated with airport-related operations. The boundaries could be determined after a future second-level study in order to ensure that communities most, or even partially affected, are included. Reparation levels could be graduated by distance and/or effect level, however, this concept will depend significantly on the ability to isolate monetary advantages and disadvantages to the study area cities from airport-related activities, as well as the Port's willingness to recognize the value of agreements with all of the communities, as opposed to single agreements with only a few.

PS.3 ..... Pursue multiple approaches to assist victims of sex trafficking

Possible roadways to identify victims and get them help include educating doctors and other medical professionals about what to look for, as well as employees in the airline and hospitality industries. Individuals in both of these arenas should be receive the Trafficking Education Network training that can make them better equipped to respond to human trafficking. Finally, the Coalition Against Trafficking in Women (CATW) influences the shaping of U.S. policy against trafficking.

PS.4 ..... Consider CPTED principles in portions of the study area

Crime Prevention Through Environmental Design (CPTED) is a design principle intended to deter criminal activity through a variety of design strategies. These include designs that encourage more pedestrian activity, street-level retail with upper-level apartments that overlook the street ("eyes on the street"), and other principles that create a diverse mixed-use environment where residents have a sense of ownership in the success of the "neighborhood." Areas that could benefit from CPTED principles include U.S. Highway 99 in the cities of SeaTac, Des Moines, and Federal Way, and First Avenue South in Burien. CPTED principles also help to diversify a community's land uses and economic base.

Public health recommendations

The following 11 recommendations are offered to address public health issues in the study area (refer to Section 12 of this study for further information):

PH.1 ..... Establish an independent noise monitoring authority

Together with the Port of Seattle, the study area cities should investigate the feasibility of establishing an independent noise monitoring authority. Collectively, members could decide if thresholds for noise established by the Federal Aviation Authority are adequate given local circumstances, as well as appropriate strategies for mitigating effects.

PH.2 ..... Expand the study area

To determine the comprehensive public health effects of operations at Seattle-Tacoma International Airport, public health statistics should also be collected for areas north and northeast of the airport. This would include West Seattle, Beacon Hill, and potentially the city of Renton. Given the presence of two other airports (Boeing Field/King County International Airport and Renton Municipal Airport), those facilities should also be taken into consideration.

PH.3 ..... Develop more detailed public health statistics

The information reviewed collected data at the municipal level. In some cases, statistics of two neighboring communities were combined (SeaTac/Tukwila and Des Moines/Normandy Park). To get a more accurate depiction of the spatial distribution of various health metrics, this information should be gathered at the census tract or enumeration district level. (While reporting by street address would be ideal, it might be prohibited under HIPAA standards.) Such information could be overlaid with noise contours and flight tracks to see if there are correlations between aircraft activity and certain health outcomes.

PH.4 ..... Approve/reauthorize bills to address mitigation

Request that the state Legislature reauthorize bills associated with the mitigation of residential properties, addressing multiple areas including past efforts that were either insufficient or that have not maintained their effectiveness, as well as properties in other communities that were not included in the initial round of funding. Investigate potential sources of funding to finance improvements (i.e., airport facility fee charged for the benefit of the study area cities.) As of the writing of this report, a draft bill is pending to address homes that were mitigated under the previous Port of Seattle packages.

PH.5 ..... Audit local building and zoning standards

Conduct an audit of the building and zoning codes for all study area cities to identify any inconsistencies between local regulations and federal rules. Establish a unified system of rules in order to ensure equity among the communities.

PH.6 ..... Identify new construction potentially affected by airport use

Identify relevant organizations that should be included as referral agencies for any new construction (residential or commercial) that may be affected by aviation-related activity (i.e., Puget Sound Clean Air Agency).

PH.7 ..... Establish a health effect assessment process

The study area cities should consider establishing a requirement that new construction projects (of a certain size and type) include preparation of a health impact assessment (HIA). Health is emerging as a significant aspect of many real estate projects, as is how real estate developments affect the health of its users and occupants, along with the community at large. An HIA is an evidence-based process that engages the community, gathers health-related information, and identifies strategies to improve community and individual health. This tool could serve both the developer and city, as well as inform future plans and policies.

PH.8 ..... Require alternative fuel use for airport users

Request the state Legislature establish an alternative fuels requirement on users of Port of Seattle facilities that could be phased in as deemed feasible.

PH.9 ..... Expand the late night noise limitation program

Encourage the Port of Seattle to expand the late night noise limitation program in ways that address community concerns, including:

- Limiting runways and flight patterns that align with the Pacific Highway, rather than established neighborhoods, during certain hours
- Accessing a graduated charge for landings and take-offs with lower fees charged during desirable hours and vice versa
- Relocate late-night cargo traffic to an alternative airfield.

PH.10 ... Replant trees in the study area

Whereas construction of the third runway reportedly necessitated the removal of several old growth trees, and whereas they were effective at absorbing some level of noise and toxins, consider establishing a replanting program in strategically advantageous locations (ensuring this uses tree and landscape species that repel and discourage bird nesting and feeding).

It is important to note that the Port of Seattle is working on a draft land stewardship plan to add trees to the airport, has funded Green cities efforts in the cities of Burien, Des Moines, and SeaTac, and has planted trees at a 4:1 ratio as part of the Flight Corridor Safety Program's removal of trees obstructing the flight paths. These programs are positive and should be continued.

PH.11 ... Expand Port efforts to promote public health

Based on review of information associated with the Port of Seattle's efforts to further strategic initiatives associated with the Federal Aviation Administration's airport Sustainability Program, it appears a limited emphasis has been placed on efforts to enhance the health and welfare of residents in the study area cities, despite the fact that among its stated goals is to "help achieve social progress by advancing a broad set of actions that ensure organizational goals are achieved in a way that is consistent with the needs and values of the local community." Existing programs including the Noise Compatibility Program and the Voluntary Airport Low Emissions (VALE) program should be adopted by the Port of Seattle. These and other solutions should be funded through the Airport Improvement Program grant funds.

Socio-economic recommendations

The following three recommendations are offered to address public health issues in the study area (refer to Section 13 of this study for further information):

SE.1 ..... All parties should commit to a shared objective

This is essentially evolving the airport and the study area cities together. Seattle-Tacoma International Airport, like many other infill airports, needs to see the communities around it as its partner, and best opportunity to evolve into an "aerotropolis." To do this, there needs to be common understanding of desired outcomes, equal commitment to a healthy whole (airport and all affected communities), regulatory alignment, consistent marketing and shared oversight.

SE.2 ..... Consider a "study area-wide" effect overlay district

This concept was mentioned in Section 11 in the context of public safety. The idea behind an airport overlay district evolved from discussions with community members regarding perceived inequities between and among the study area cities, particularly as they relate to positive and negative effects resulting from airport operations. The intention is to establish a mechanism whereby revenues and expenses could be shared equitably (if not equally), and comparative inequities could be neutralized. For example, if one community is deemed more appropriate for a certain airport-supporting business or land use, facilitate its development in that location, but allow all of the communities to share in its economic contribution. An overlay district could also maintain design and development standards and regulations in order to ensure consistency across municipal lines.

SE.3 ..... Conduct additional analyses

This has been mentioned in previous sections of this report but consider amending work completed for this effort with similar analyses of other jurisdictions potentially equally effected by airport operation. These analyses should also be supplemented with review of various reports that were ongoing while this one was being prepared, and additional research into areas omitted from the scope of this assignment. Additional areas of investigation might include cost-benefit analysis of Port-owned parcels in the city of SeaTac, update to airport trip origins, surveys of local brokers regarding the perceived effect of airport operations on real estate, market feasibility studies for land uses and real estate product types absent or under-represented, and a housing inventory to understand the effect of Port mitigation packages.

General recommendations

The following seven recommendations are offered to general address issues and concerns not covered by individual sections of this study:

G.1 ..... Establish a single source data clearinghouse

The 2020 study collected and reviewed a wide variety of data from numerous agencies and sources. Many data gaps were noted because of the way data was collected over a 22-year period, missing information, inconsistencies in the way data was reported, etc. Given that much of this data was available online, it is recommended that a single source be established to collect and compile the information for the areas covered in this study. This could be a series of live links to existing databases maintained by other agencies, a single local or regional agency that collects and updates these databases, or some other method. A regional agency like the Puget Sound Regional Council is one option, but other options should be explored to determine an appropriate "data clearinghouse."

G.2 ..... Expand the study area

The study area covered a 61.36 square mile area in South King County. The consultant team was not involved in the determination of the study area but suggests that it should be expanded so the airport falls in the center of the study area. That means areas to the north of Seattle-Tacoma International Airport that were not part of the 2020 study area would be similarly research and assessed. Based on community comments from residents outside of the study area, it is

suspected that there are undocumented effects outside of the study area that would be a more accurate representation of community effects.

G.3 ..... Expand participation by the Port of Seattle

The Port of Seattle has participated in numerous community outreach programs – from StART and Soundside Alliance to numerous development and tourism grants, to name a few. The Port of Seattle staff provided the consultant team with information and data when requested during the 2020 study but was not present at any of the monthly TAC meetings that involved the consultant team. Should follow-up studies be conducted with a similar advisory committee, Port of Seattle staff should be a more active participant.

G.4 ..... Improve the airport/community relationship

At stakeholder interviews and the public workshops, a great deal of community distrust was displayed regarding Seattle-Tacoma International Airport, the Port of Seattle, and the Federal Aviation Administration. This included comments that go as far back as the second runway (1970), the mitigation packages associated with the third runway, noise concerns associated with NextGen procedures, and other similar concerns. It would be beneficial for both the airport and the study area cities to find areas of common ground and work together to not only improve this relationship, but to minimize the effects noted by this study.

Again, the relationship with the airport varies between study area cities. The city of SeaTac reports that it has a very good working relationship with the Port of Seattle, so this recommendation is not universal across the study area.

G.5 ..... Develop a plan for airport-adjacent perimeter areas

The Port of Seattle should work collaboratively with Burien, Des Moines, and SeaTac to develop a plan for undeveloped and under-developed areas surrounding Seattle-Tacoma International Airport as revenue-generating uses that are compatible with each city's comprehensive plan. Uses such as the Federal Detention Center and the Federal Aviation Administration campus bring employment, but federal entities generate no revenue for the local community. This plan would include airport property and extend into neighboring areas where new compatible development could be accommodated (such as mixed-use transit-oriented development around the Angle Lake Link light rail station, and new hospitality/conferencing development in Burien, Des Moines and SeaTac). A market study would be necessary to determine which land uses would be warranted, and developed parcels should remain as revenue-generating portions of each host city.

G.6 ..... Follow NPIAS attribute #5 regarding surrounding communities

Page 1 of the NPIAS (National Plan of Integrated airport Systems) – a report submitted to Congress every two years by the Secretary of Transportation – lists eight attributes that airports should follow. Attribute #5 is particularly appropriate, stipulating that "airports should be compatible with surrounding communities, maintaining a balance between the needs of aviation, the environment, and the requirements of residents." The Port of Seattle should work collaboratively with all of the cities in the study area to ensure the operation and growth of Seattle-Tacoma International Airport is compatible with its surrounding communities.

G.7 ..... Conduct an expanded Phase 2 study

The 2020 study was tasked with evaluating data for the period 1997 through 2019 in a wide variety of subjects. The schedule for the entire project was set at 12 months, with all research, assessment, and documentation compressed into a seven-month time frame and limited only to readily available data (no new sampling, monitoring, or modelling), with a consultant budget of $496,000. While there were some parallels with a similar study prepared for CTED (completed in 1997), that effort had a larger budget ($775,000) – approximately $1.3 million in 2020 dollars Therefore, it is recommended that a Phase 2 study be authorized with a budget that allows for more sampling, monitoring, and modelling.

G. THE FUTURE

The Greek philosopher Heraclitus is credited with the quote "the only constant in life is change." That still holds true today. Everything in the study area has continued to evolve and change from 1997 to 2020:

- Since 1997, population has continued to grow in each study area city, in King County, in Seattle, and throughout the region.
- Operations have increased at Seattle-Tacoma International Airport.
- Technological improvements have lowered emission aircraft emissions and noise.
- Technological improvements have made vehicles more fuel efficient and less polluting.
- Technological changes have altered the way we do business (email, video conferencing, co-working spaces), and the way we travel (light rail, Uber, Lyft, etc.), to name a few.

No study or report can accurately predict the future. However, some potentials on the horizon may influence travel at Seattle-Tacoma International Airport. Should these occur, it is recommended that the study area be considered to ensure there are no adverse effects as a result of these new potentials:

- A potential new airport to augment/supplement operations at Seattle-Tacoma International Airport
- Changes in aviation technology including STOL/VTOL aircraft, advanced engines and aircraft design
- Electric cars that reduce air pollution and reliance on fossil fuels
- Autonomous vehicles that might improve traffic congestion
- Flying cars and taxis are currently being developed by several companies and are scheduled to be tested in 2020 through 2023.
- 5G cellular technology holds the promise of high-speed digital service that could change the nature of offices and commuting.
- Increasing reliance on Low-Effect Design (LID) and sustainable green building practices
- Ongoing regional growth has the potential to strain all infrastructure – water, sanitary sewer, storm drainage, roadways – resulting in increased potentials for pollution and congestion.
- The Hyperloop concept may offer a future alternative to short- and medium-haul air travel.

No future is assured. Any one of the above could be unsustainable, not feasible, too expensive, not accepted by the public, or could fail for any number of unknown reasons. Similarly, there may be other technological advancements as-yet unknown that could have a significant effect on daily life.

H. CLIMATE CHANGE

While the issue of climate change was not part of the project scope, the issue arose as a question from several community members during this project. The consultant team was asked "what are you doing to address climate change?" and some community members expressed frustration that this was not part of the project.

To clarify, the consultant team was not asked to investigate any effects that Seattle-Tacoma International Airport might have on climate change. The project resources (time and budget) were also insufficient to address such a broad and complex issue.

The 2020 study agrees with the bulk of climate research – that the climate has been increasingly affected by human activity. This is supported by research by scientists and academicians across the world. In 2016, 196 countries signed the Paris Accords to address climate change and its underlying causes. (The U.S. withdrew from the agreement in June 2017.)

The 2020 study did not research the issue of aviation-induced climate change, but it was addressed at the 2019 Paris Air Show. An article in Fortune magazine (June 2019) contained the following quote:

> "Aviation currently accounts for around 2.5% of global carbon emissions, and the industry has pledged to halve its 2005-level footprint by 2050 through an offsetting program. Therefore, engineering firms were keen to showcase a range of eco-friendly inventions such as hybrid engines, urban mobility vehicles, and autonomous flight systems at the annual event, the largest for the aerospace industry. . . .It's not just environmental considerations driving the research: UBS estimates sales of hybrid engines will be worth $178 billion by 2040, while the electric vertical take-off and landing (eVTOL) market will be a $285 billion business by 2030."

The above quote did not specify which components of "aviation" account for 2.5% of global carbon emissions nor the source of this figure. It could be limited to aircraft emissions while operational, or it could involve the entire product life-cycle – from manufacture to decommissioning. The 2.5% figure likely does not address other airport-related activities, including ground transportation by travelers and employees.

The above quote makes an economic case for changes in aircraft technology (likely as a cost-savings for airlines and owners), which will have a secondary benefit of addressing environmental concerns. These remain speculative projections at this point, but it is hoped that advances in hybrid and electromotive propulsion will have the added benefit of significantly reducing noise and air pollution.

Beyond aircraft technology, there are promising trends in market acceptance of automobiles and light trucks with hybrid and fully-electric engines. This can help to reduce tailpipe emissions but may also shift some energy-generation burdens to the power grid (for electric vehicle recharging). Simpler and perhaps more effective measures are those that promote developments that encourage walkability, biking, and transit use – something that is happening across the region and the U.S.

The Port of Seattle is taking steps to address environmental concerns – from replacing old high mast lighting with high-efficiency LEDs and usage of more hybrid and electric vehicles, to development of the Sustainable Airport Master Plan. But the 2020 study will not address – and was not asked to address – any potential climate change effects associated with operations at Seattle-Tacoma International Airport. This is an issue that is worth a separate investigation and study.

I. IN CLOSING

To reiterate the statement made on page 1 of this document, the 2020 study is <u>not intended</u> to oppose or impede the operations, growth, or success of Seattle-Tacoma International Airport. The 2020 study acknowledges the regional and statewide significance of Seattle-Tacoma International Airport and has attempted to objectively and independently evaluate and assess a variety of effects – positive, negative, and neutral – associated with its operation and to establish a baseline that may be used to evaluate future operations.

The consultant team has attempted to gauge the effects of having the airport as a "neighbor," but all answers are entirely clear. Additional studies, including expansion of the study area, are necessary to get a more comprehensive and complete picture of any effects associated with Seattle-Tacoma International Airport.

As noted in this document, the principal issues associated with aviation activity were **noise** and **air quality**:

- The 2020 study can conclude there is a direct correlation between aviation activity and noise complaints in the study area. Noise effects may also have an associative relationship to other concerns, including stress, health effects, learning disruption, home values, and others. But those

associative effects require additional modelling, sampling, and study in order to make a direct correlation.

- Similarly, there are associative effects with emissions from aircraft usage. Due to the inadequate air quality monitoring network, the extent of these effects cannot be identified. There are similar anecdotal concerns about effects on health, property values, and economic development, but more data is necessary to show a direct causation. Ongoing research on human health issues associated with UFPs (ultra-fine particulate matter) will also be helpful in this effort.

Other issues investigated – **mobility**, **surface water quality**, **groundwater and soil quality**, **public safety**, **public health**, and **socio-economic effects** – require additional study to determine what effects (if any) are associated with Seattle-Tacoma International Airport. Only effects associated with **light** were found not to be a significant issue in the study area.

Change has been the one constant in South King County and the region. The study area cities and Seattle-Tacoma International Airport have grown up together for more than 75 years. There are portions of the study area cities that are much more urbanized in 2020 than they were years earlier. And while the airport has continued to grow, the pace of its growth has accelerated since 2000, far eclipsing the pace of growth locally and regionally.

The 1997 study could not predict the rise of such innovations as smartphones, social media, or app-driven car services. Twenty-three years later, much has changed that is now part of everyday life. Even something as basic as light rail was only a proposal in 1997 – but in 2020, it is an important link in accessing Seattle-Tacoma International airport.

So, in the next 23 years – by 2043 – there could be new changes that are presently beyond imagination, including new modes of travel, new means of aircraft propulsion, and new technologies that change how we live, work, play and travel.

As enticing as the future is, there are pressing concerns that face the study area cities in 2020. While an important component in the region's economy, Seattle-Tacoma International Airport should also strive to minimize effects from its operation so that the residents of Burien, Des Moines, Federal Way, Normandy Park, SeaTac, and Tukwila do not bear an undue burden, primarily due to noise and air quality effects.

An aphorism often attributed to President John F. Kennedy states that "a rising tide lifts all boats." It is recommended that this be a guiding principle in the development and operation of Seattle-Tacoma International Airport. What benefits the airport should have an associated benefit to the surrounding study area cities. And by extension, operations at the airport should not negatively affect its neighbors.

This page intentionally left blank