Working Paper One

BFI

MASTER PLAN UPDATE

# King County International Airport/ Boeing Field

Mead & Hunt

# Working Paper One

**May 2016**

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## MASTER PLAN UPDATE

# King County International Airport/ Boeing Field

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# Acronyms

| | |
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| **AAF** | Army Air Field |
| **AASF** | Army Aviation Support Facility |
| **AAQS** | Ambient Air Quality Standards |
| **AC** | Advisory Circular |
| **ACRP** | Airport Cooperative Research Program |
| **ADG** | Airplane Design Group |
| **ADO** | Airports District Office |
| **AG** | Agricultural District |
| **AGL** | Above Ground Level |
| **AGIS** | Advanced Ground Informational Systems |
| **AIP** | Airport Improvement Program |
| **AIRS** | Aerometric Information Retrieval System |
| **ALP** | Airport Layout Plan |
| **ALS** | Approach Lighting System |
| **ALSF** | Approach Lighting System with Sequenced Flashers |
| **AMSL** | Above Mean Sea Level |
| **AOC** | Airport Operating Certificate |
| **AOE** | Airport of Entry |
| **AOPA** | Aircraft Owners and Pilots Association |
| **APV** | Approach Procedure with Vertical Guidance |
| **AQP** | Aquifer Protection Area |
| **ARC** | Airport Reference Code |
| **ARFF** | Aircraft Rescue and Firefighting Facility |
| **ARTCC** | Air Route Traffic Control Center |
| **ASDA** | Accelerate Stop Distance Available |
| **ASDI** | Aircraft Situation Display to Industry |
| **ASO** | Aviation Service Operator |
| **ASOS** | Automated Surface Observing System |

| | |
|---|---|
| **ASV** | Annual Service Volume |
| **ATC** | Air Traffic Control |
| **ATCT** | Airport Traffic Control Tower |
| **AVGAS** | Aviation Gasoline |
| **AWACS** | Airborne Warning and Control System |
| **BCA** | Benefit Cost Analysis |
| **BLF** | Boarding Load Factor |
| **BMP** | Best Management Practice |
| **BCT** | Brigade Combat Team |
| **BFI** | King County International Airport/Boeing Field |
| **BNSF** | Burlington Northern Santa Fe Railroad |
| **CAP** | Civil Air Patrol |
| **CBD** | Central Business District |
| **CFR** | Code of Federal Regulations |
| **CG** | General Commercial District |
| **CH** | Commercial High Intensity District |
| **CIP** | Capital Improvement Program |
| **CO** | Carbon Monoxide |
| **COL** | Non-Recyclable Construction, Demolition, and Land Clearing Waste |
| **CS** | Commercial Shopping Center District |
| **CSSN** | Capacity/Safety/Security/Noise |
| **CTAF** | Common Traffic Advisory Frequency |
| **DER** | Decision End of Runway |
| **dB** | Decibel |
| **DNL** | Day-Night Noise Level |
| **DOD** | Department of Defense |
| **EPA** | Environmental Protection Agency |
| **EFH** | Essential Fish Habitat |
| **ESA** | Endangered Species Act |
| **FAA** | Federal Aviation Administration |
| **FAR** | Federal Aviation Regulations |
| **FAS** | Final Approach Segment |
| **FATO** | Final Approach and Takeoff Area |
| **FBO** | Fixed Base Operator |
| **FCT** | FAA Contract Tower |
| **FEMA** | Federal Emergency Management Agency |
| **FIS** | Federal Inspection Services |
| **FPPA** | Farmland Protection Policy Act |
| **FSS** | Flight Service Station |
| **GA** | General Aviation |

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|---|---|
| **GAO** | U.S. General Accounting Office |
| **GDP** | Gross Domestic Product |
| **GMA** | Growth Management Act |
| **GQS** | Glidepath Qualification Surface |
| **GPS** | Global Positioning System |
| **HIRL** | High Intensity Runway Lights |
| **IAP** | Instrument Approach Procedure |
| **ICAO** | International Civil Aviation Organization |
| **ICE** | Immigration and Customs Enforcement |
| **IFR** | Instrument Flight Rules |
| **IH** | Industrial Heavy District |
| **IL** | Industrial Light District |
| **ILS** | Instrument Landing System |
| **IM** | Industrial Moderate District |
| **IMC** | Instrument Meteorological Conditions |
| **INM** | Integrated Noise Model |
| **INS** | Immigrations and Naturalization Service |
| **ISGP** | Industrial Stormwater General Permit |
| **JPATS** | Justice Prisoner & Alien Transportation System |
| **KCIA** | King County International Airport |
| **LATS** | Long-Term Air Transportation Study |
| **LDA** | Landing Distance Available |
| **LIRL** | Low Intensity Runway Lights |
| **LITL** | Low Intensity Taxiway Lights |
| **LOI** | Letter Of Intent |
| **LOS** | Level of Service or Line of Sight |
| **LPV** | Localizer Performance with Vertical Guidance |
| **MALS** | Medium Intensity Approach Lighting System |
| **MALSR** | Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights |
| **MAS** | Missed Approach Segment |
| **MIRL** | Medium Intensity Runway Lights |
| **MITL** | Medium Intensity Taxiway Lights |
| **MOF** | Museum of Flight |
| **MTOW** | Maximum Takeoff Weight |
| **NAAQS** | National Ambient Air Quality Standards |
| **NACD** | Native American Consultation Database |
| **NAS** | National Airspace System |
| **NASA** | National Aeronautics and Space Administration |
| **NAVAIDS** | Navigational Aids |
| **NBAA** | National Business Aviation Association |

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|---|---|
| **NCDC** | National Climatic Data Center |
| **NCP** | Noise Compatibility Program |
| **NDB** | Non-Directional Beacon |
| **NEPA** | National Environmental Policy Act |
| **NDPES** | National Pollutant Discharge Elimination System |
| **NHPA** | National Historic Preservation Act |
| **NM** | Nautical Mile |
| **NMFS** | National Marine Fisheries Service |
| **NO2** | Nitrogen Dioxide |
| **NOAA** | National Oceanic and Atmospheric Administration |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NPE** | Non-Primary Airports Entitlement |
| **NPIAS** | National Plan of Integrated Airport Systems |
| **NRCS** | National Resources Conservation Service |
| **NRHP** | National Register of Historic Places |
| **OCS** | Obstacle Clearance Surface |
| **ODALS** | Omnidirectional Approach Lighting System |
| **OL** | Office Low Intensity Districts |
| **OPBA** | Operation per Based Aircraft |
| **PAE** | Snohomish County Airport/Paine Field |
| **PAPI** | Precision Approach Path Indicator |
| **PCA** | Permit Compliance System |
| **PHS** | Priority Habitats and Species |
| **PLU** | Pierce County Airport/Thun Field |
| **PM** | Particulate Matter |
| **PPRP** | Prior Permission Required Pavement |
| **PSRC** | Puget Sound Regional Council |
| **PVC** | Poor Visibility and Ceiling |
| **PWT** | Bremerton National Airport |
| **RCL** | Runway Centerline Lighting |
| **REIL** | Runway End Identifier Lights |
| **RM** | Residential Multifamily District |
| **RMH** | Residential Manufactured Home District |
| **RNAV** | Area Navigation |
| **RNP** | Required Navigation Procedure |
| **RNT** | Renton Municipal Airport |
| **ROFA** | Runway Object Free Area |
| **RPZ** | Runway Protection Zone |
| **RS** | Residential Single-Family District |
| **RSA** | Runway Safety Area |

| | |
|---|---|
| **RTR** | Remote Transmitter/Receiver |
| **RVR** | Runway Visual Range |
| **S36** | Crest Airpark (Kent) |
| **S43** | Harvey Field |
| **S50** | Auburn Municipal Airport |
| **SEA** | Seattle-Tacoma International Airport |
| **SEL** | Sound Exposure Level |
| **SEPA** | State Environmental Policy Act |
| **SID** | Standard Instrument Departures |
| **SKOL** | Southern Kansas Oklahoma Line Railroad |
| **SOx** | Sulfur Dioxide |
| **SPCC** | Spill Prevention, Control, and Countermeasures |
| **SSALR** | Short Simplified Approach Lighting System with Runway Alignment Indicator Lights |
| **SSALS** | Simplified Short Approach Lighting System |
| **STAR** | Standard Terminal Arrival Routes |
| **TAA** | Tulsa Airport Authority |
| **TACAN** | Tactical Air Navigation |
| **TAF** | Terminal Area Forecasts |
| **TAIT** | Tulsa Airport Improvement Trust |
| **TDG** | Taxiway Design Group |
| **TDZ** | Touchdown Zone |
| **TERPS** | United States Standard for Terminal Instrument Approach Procedures |
| **TIA** | Turn Initiation Area |
| **TIW** | Tacoma Narrows Airport |
| **TLOF** | Touchdown and Liftoff Area |
| **TOFA** | Taxiway Object Free Area |
| **TODA** | Takeoff Distance Available |
| **TORA** | Takeoff Run Available |
| **TRACON** | Terminal Radar Approach Control |
| **TSA** | Transportation Security Administration |
| **TSS** | Threshold Siting Surface |
| **TUL** | Tulsa International Airport |
| **UNICOM** | Universal Communications |
| **UPS** | United Parcel Service |
| **USACE** | U.S. Army Corps of Engineers |
| **USDA** | United States Department of Agriculture |
| **USEPA** | U.S. Environmental Protection Agency |
| **USFWS** | United States Fish and Wildlife Service |
| **VFR** | Visual Flight Rules |
| **VHF** | Very High Frequency |

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|---|---|
| **VLJ** | Very Light Jet |
| **VMC** | Visual Meteorological Conditions |
| **VOR** | Very High Frequency Omnidirectional Range |
| **VOR/DME** | Very High Frequency Omnidirectional Range with Distance Measuring Equipment |
| **VORTAC** | Very High Frequency Omnidirectional Range/Tactical Air Navigation |
| **WAAS** | Wide Area Augmentation System |
| **WANG** | Washington National Guard |
| **WDFW** | Washington State Department of Fish and Wildlife |
| **WHPA** | Wellhead Protection Area |
| **WHR** | Washington Heritage Register |

# Glossary

**Above Mean Sea Level.** The elevation of an object above the average sea level.

**Air Carrier.** A commercial airline with published schedules operating at least five round trips per week.

**Aircraft Operation.** An aircraft arrival (landing) or an aircraft departure (takeoff) represents one aircraft operation.

**Aircraft Rescue and Firefighting Facility.** A facility housing specifically trained personnel and equipment in response, firefighting, hazard mitigation, evacuation, and rescue of passengers and crew of an aircraft involved in a ground emergency.

**Airport Layout Plan.** The official, FAA approved drawing of an airport's existing and proposed facilities.

**Airport Reference Code.** An FAA design criteria based upon the approach speed (represented by a capital letter) and wingspan (represented by a roman numeral) of an aircraft that produces a minimum annual itinerant operations per year at an airport.

**Airport Traffic Control Tower.** A central operations tower in the terminal air traffic control system with an associated IFR room if radar equipped, using air to ground communications and/or radar, visual signaling, and other devices to provide the safe and expeditious movement of air traffic.

**Air Route Traffic Control Center.** A facility providing air traffic control to aircraft on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

**Air Traffic Control.** The control of aircraft traffic in the vicinity of airports from control towers, and in the airways between airports from control centers.

**Annual Service Volume.** A reasonable estimated of an airport's annual capacity (i.e., the level of annual aircraft operations that will result in an average annual aircraft delay of approximately one to four minutes).

**Approach Lighting System.** Radiating light beams guiding pilots to the extended runway centerline on final approach and landing.

**Area Navigation.** A method of navigation that permits aircraft operation on any desired course within the coverage of station-referenced navigation signals or within the limits of a self-contained system capability, or a combination of these.

**Boarding Load Factor.** The ratio of aircraft seats available for passenger boarding compared to the number of passengers actually boarding.

**Common Traffic Advisory Frequency.** The name given to a VHF radio frequency used at U.S., Canadian, and Australian airports that do not have an active or on-site control tower.

**Decibel.** A measurement used to quantify sound levels referencing a scale from the threshold of human hearing, 0 dB, upward toward the threshold of pain, about 120-140 dB.

**Distance Measuring Equipment.** Equipment used to measure, in nautical miles, the distance of an aircraft from the broadcasting facility.

**Day-Night Noise Level.** The daily average noise metric in which noise occurring between 10:00 p.m. and 7:00 a.m. is penalized by 10 db. DNL is often expressed as annual average noise levels.

**Federal Aviation Regulations.** The rules and regulations that govern the operation of aircraft, airways, airmen, and airports.

**Fixed Based Operator.** A facility on an airport providing various services for aircraft such as maintenance, fuel, storage, etc.

**Fleet Mix.** The mix or differing aircraft types operated at a particular airport or by an airline.

**Flight Plan.** Specific information related to the intended flight of an aircraft, filed with a Flight Service Station or Air Traffic Control facility.

**General Aviation.** Civil aviation excluding air carriers, commercial operations, and military aircraft.

**Glide Slope.** An angle of approach to a runway established by means of airborne instruments during instrument approaches, or visual ground aids for the visual portion of an instrument approach and landing.

**Global Positioning System.** A satellite-based radio positioning, navigation, and time-transfer system.

**High Intensity Runway Lights.** High intensity light fixtures delineating the limits of a runway served by a precision instrument approach procedure.

**Instrument Approach.** A series of predetermined maneuvers developed for the orderly transfer of aircraft under instrument flight conditions, from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

**Instrument Flight Procedure.** Procedures developed by the FAA to guide aircraft to airports including distance, topography, elevation, coordinates, angle of approach, and missed approach procedures.

**Instrument Flight Rules.** Rules specified by the FAA for the flight under weather conditions in which visual reference cannot be made to the ground and the pilot must rely on instruments to fly and navigate.

**Instrument Landing System.** A precision instrument approach system that normally consists of a localizer antenna, glide slope antenna, outer marker, middle marker, and ad approach lighting system.

**Instrument Meteorological Conditions.** Weather conditions that require that pilots rely primarily on instrumentation for navigation under IFR, rather than by visual reference and VFR.

**Itinerant Operation.** An aircraft landing or takeoff that originates at one airport and terminates at another (place-to-place).

**Knots.** A measure of speed used in navigation. One knot is equal to one nautical mile per hour (1.15 knots – 1 mile per hour).

**Landing Minimums.** Prescribed altitudes and visibility distances that the pilot uses to make a decision as to whether or not it is safe to land on a particular runway.

**Local Operation.** An aircraft landing or takeoff that remains in the local traffic pattern (i.e. training or touch-and-go operation).

**Level of Service.** A measure that determines the quality of service provided by transportation devices, or transportation infrastructure, and is generally linked to time and speed of the vehicles.

**Low Intensity Runway Lights.** Low intensity light fixtures delineating the limits of a runway having no instrument approach procedures.

**Load Factor.** The percentage of seats occupied on an aircraft by passengers.

**Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights.** A medium intensity approach lighting system providing a visual lighting path for landing pilots, consisting of nine light bars with five steady burning white fixtures, five sequential flashing white fixtures, and a threshold bar of 18 steady burning green fixtures.

**Medium Intensity Runway Lights.** Medium intensity light fixtures delineating the limits of a runway supplied with a non-precision instrument approach procedure.

**Middle Marker.** A beacon that defines a point along the glide slope of an Instrument Landing System, normally located at or near the point of decision height.

**Missed Approach.** An instrument approach not completed by a landing. This may be due to visual contact not established at authorized minimums or instructions from air traffic control, or other reasons.

**National Ambient Air Quality Standards.** Standards established by the United States Environmental Protection Agency for six outdoor air pollutants considered harmful to the public health and the environment.

**National Airspace System.** The common network of U.S. airspace, air navigation facilities, equipment and services, airports or landing areas, aeronautical charts, information and services, rules, regulations and procedures, technical information, manpower, and material.

**National Plan of Integrated Airport Systems.** Established by the Airport and Airway Improvement Act of 1982, it is the identification of national airport system needs including short- and long-term development costs.

**Nautical Mile.** A measure of distance used in air and sea navigation. One nautical mile is equal to the length of one minute of latitude along the Earth's equator, officially set as 6,076.115 feet.

**Navaid.** Any facility providing assistance or aid to pilots for navigating through the air.

**Noise Contour.** The "map" of noise exposure around an airport, computed by the Integrated Noise Model. The FAA defines significant noise exposure as any area within the 65 DNL contour, which is the area within an annual average noise exposure of 65 decibels or higher.

**Non-Directional Beacon.** A navaid providing signals that can be read by pilots of aircraft equipped with direction finding equipment, used to determine bearing and can "home" in or track to or from the desired point.

**Non-Precision Approach.** A standard instrument approach procedure in which no vertical guidance is provided.

**Omnidirectional Approach Lighting System.** An approach lighting system consisting of five sequential flashing omnidirectional lights extended along the runway centerline and two located on either side of the runway threshold.

**Outer Marker.** A navigational facility within the terminal area navigational system located four to seven miles from the runway threshold on the extended centerline indicating the beginning of the final approach.

**Precision Approach Path Indicator.** A visual navigational aid providing guidance information to help pilots acquire and maintain the correct approach (in the vertical plane) to a runway.

**Runway.** A strip of pavement, land, or water used by aircraft for takeoff or landing.

**Runway Object Free Area.** A defined two-dimensional surface centered on a runway providing enhanced safety for aircraft operations by having the area free of objects protruding above the runway safety area edge elevation, except for objects that need to be located within the area for air navigation or aircraft ground maneuvering purposes.

**Runway Safety Area.** A defined surface surrounding a runway prepared or suitable for reducing the risk or damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway.

**Runway Visual Range.** Facilities providing a measurement of horizontal visibility located adjacent to instrument runways.

**Single Event.** Noise generated by a single aircraft overflight.

**Tactical Air Navigation.** An enroute navaid combining azimuth and distance measuring equipment into one unit and operated in the ultra-high frequency band.

**Taxiway.** A designated area that connects runways with aprons, providing the ability to move aircraft on the ground so they will not interfere with takeoffs or landings.

**Terminal Airspace.** The airspace controlled by a terminal radar approach control facility.

**Terminal Area.** A general term used to describe airspace in which approach control service or airport traffic control service is provided.

**Terminal Radar Approach Control.** An FAA air traffic control service to aircraft arriving, departing, or transiting airspace controlled the facility.

**Transient Aircraft.** An aircraft that is not based at the airport in which it is currently located.

**Very High Frequency Omnidirectional Range.** A ground based electronic navigation aid transmitting navigation signals for 360° oriented from magnetic north.

**Very High Frequency Omnidirectional Range/Tactical Air Navigation.** A ground based electronic navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment at a single site.

**Visual Approach.** An aircraft approach conducted under IFR, which authorizes the pilot to proceed visually and clear of clouds to the airport. The pilot must, at all times, have either the airport or the preceding aircraft in sight.

**Visual Flight Rules.** Rules that govern the procedures for conducting flight under visual meteorological conditions.

**Visual Meteorological Conditions.** Weather conditions under which pilots have the ability to visually see and avoid stationary objects and other aircraft and fly without the use of instrumentation, under VFR.

# A Inventory of Existing Conditions

**INTRODUCTION.** Following approval for construction in 1928 as the region's first municipal airport, King County International Airport/Boeing Field (BFI) has grown to be one of the busiest primary non-hub airports in the nation and the primary general aviation reliever airport to Seattle-Tacoma International Airport (SEA). BFI also ranks among the most successful public investments in state history and is a major contributor the region's economic stability and sustainability. According to the *King County International Airport Economic Impact Study*, BFI's economic impact is $3.5 billion in terms of local business sales that support 16,336 jobs and generates $1.8 billion in labor income to King County. The Airport's 150 tenant businesses, which includes the Boeing Company's various civilian and military aircraft Flight Test and Delivery Center operations, directly support 5,209 jobs in the local economy.

On a regional/national level, information provided by the King County Aerospace Alliance identifies King County as the largest center for aerospace activity in the country with over 45,000 industry employees and more than 400 aerospace companies. BFI is also the home of the Museum of Flight, with its wide variety of aircraft and exhibits showcasing aviation history, and frequently the "airport of choice" for celebrities, dignitaries, and corporate aircraft operators because of its proximity to downtown Seattle. In 2001, BFI was named by the National Air Transportation Association as one of the "100 Most Needed Airports" in the United States.

BFI serves a wide variety of aviation users that include small commercial passenger airlines, large and small air cargo carriers, commercial general aviation Fixed Base Operators (FBOs), corporate general aviation flight departments, private aircraft owners, helicopters, and military aircraft. In 2015, BFI recorded 20,214 enplanements, 165,571 aircraft takeoffs/landings, and 390 based aircraft. Also, in 2014 BFI ranked as the 27th busiest cargo airport in the country, recording a landed weight of 407,629 tons, representing an increase of 7.35% from 2013 data.

The previous Airport Master Plan was completed/adopted in 2004 and has been recognized as an accurate representation of the overall concepts that drive operations and development of the Airport. However, in consideration of the significant changes in local, regional and national aviation industry considerations, the document is in need of a comprehensive update. This Master Plan Update (MP Update) will assist in documenting the current state of the aviation industry at BFI, and ultimately support the modernization and improvement of existing airport facilities.

The study process shall revalidate, refine, and propose various adjustments to the current Airport build-out program, and the findings will serve as the strategic guide for overall economic development opportunities and sustainability recommendations. The planning recommendations will identify milestones and phasing strategies, including a finance program to guide both landside and airside development over a 20-year planning horizon. The County's Strategic Plan Goals and Objectives, as defined in the *King County Strategic Plan* and the *King County International Airport Strategic Plan 2014-2020*, will inform the development of the MP Update and serve as an Airport Management business decision-making tool (i.e., the roadmap) for the development of capital projects, sustainability, and customer service. The MP Update will also provide a framework to maintain and enhance the Airport as a major regional economic and employment center.

A listing of the planning goals and supporting objectives defined in the *King County International Airport Strategic Plan 2014-2020* are presented in the following text:

- ***Goal 1: Support Economic Vitality in the Region***
  - *Boeing Retention.* Continue to work with Boeing to ensure that their property and business needs are integrated into the airport's long-term property plans.
  - *Property Development and Redevelopment.* Conduct assessments of key strategic properties, both on and off the airport footprint to determine the uses that best align with KCIA's long-term vision.
  - *Decision Tools.* Develop decision tools that will provide the necessary information to support critical policy choices and clearly show how individual decisions relate to the dual mandates to maximize economic impact and financial capacity to invest.
  - *Economic Development.* Collaborate with other County departments to ensure that KCIA's efforts are appropriately aligned with broader County economic development goals and initiatives.

- ***Goal 2: Financial Performance***
  - *Value Pricing.* Develop a comprehensive pricing structure that will appropriately reflect the value that customers and tenants are receiving. The pricing structure should bring into alignment all of KCIA's fees and charges to ensure that customers and tenants are paying in proportion to their use of facilities and the value they derive from that use.
  - *Cost Containment.* Aggressively manage costs to support net operating income.

- *Cost recovery.* Identify opportunities for KCIA to allocate costs to tenants and customers, where such pass-throughs are authorized by County code and can be justified using appropriate cost allocation methods.
- *Financial Targets.* Develop specific financial performance targets that will support current investment plans and ensure that KCIA is generating an appropriate rate of return on its assets.

- ***Goal 3: Maintain a World Class Facility***
  - *Facility Investment.* Invest in capital replacement based on needs identified using appropriate asset management standards and based on life cycle costs of airport facilities.
  - *Customer service.* Ensure that there is a customer-oriented focus throughout the organization and that customer and tenant needs are factored into operational and policy decisions.
  - *Security and safety.* Provide for the security and safety needs of the airport, including customers, tenants, employees and the broader community.

- ***Goal 4: Organizational Development and Capacity***
  - *Invest in Organizational Capacity.* Identify organizational capacity needs to support an enhanced focus on business development and strategic investment decisions.
  - *Organizational Structure.* Align the organizational structure and core competencies to support implementation of the strategic plan and to maximize cost effectiveness of KCIA's operations.
  - *Continuous Improvement.* Build the efficiency and core competencies of the organization through application of continuous improvement and application of Lean principles.

- ***Goal 5: Environmental Stewardship***
  - *Noise Impacts and Mitigation.* Continue to implement and enhance the noise mitigation program.
  - *Climate Change.* Align KCIA programs and services with County climate change goals.
  - *Environmentally Sensitive Design.* To the maximum extent possible, incorporate environmentally sensitive design into KCIA capital projects.

- ***Goal 6: Communications and Community Partnerships***
  - *Transparency.* Operate in an open and transparent way to build trust with customers, tenants, stakeholders, decision makers, and the broader community.
  - *Stakeholder engagement.* Ensure appropriate level of consultation with key stakeholders and work collaboratively to foster mutually beneficial solutions.
  - *Industry leadership.* Increase KCIA's influence within the aviation industry through effective participation in select membership and trade organizations.

- *Neighborhood & community.* Act as a partner to neighboring residents, businesses, and organizations.

In addition, the MP Update must provide an updated on-airport land use plan that is compatible with the environment and land uses adjacent to the Airport, as well as other modes of transportation and the surrounding airports in the region. The requirement of future facilities will be evaluated not only from an aviation standpoint, but also the relationship of airport facilities to the surrounding land uses, and the community as a whole. The focus will be on the total aviation facility and its environs, with the overall planning goal being the development of an aviation facility that can accommodate future demand, is not significantly constrained by its environs, and does not adversely impact its surroundings.

## Public Outreach/Communication Plan

The MP Update includes a Public Involvement Plan that defines the proposed communication and community engagement process for the project, including overall goals; key community audiences, information needs and messages; and proposed community engagement activities.

**Communication and Outreach Goals.** Throughout the MP Update process, King County and the project team will strive to:

- Consult with BFI partners, stakeholders and the broader community about the master planning process, establishing the purpose of the work, the schedule and process by which the plan will be developed.
- Ensure that the public knows how they can be involved and understands how their input will be considered.
- Collaborate with airport partners and a stakeholder working group to identify feedback for consideration in the master planning process.
- Solicit substantive and meaningful public input at appropriate milestones, and incorporate these ideas into the plan to the maximum extent possible.
- Conduct a public outreach process that is transparent, accessible, and reflective of the County's commitment to equity and social justice.

King County's 2011 guidance on community engagement[1] builds on the county's Strategic Plan, as well as the Equity and Social Justice Ordinance. It identifies several levels of potential engagement, depending on project conditions and objectives. The MP Update is categorized within the "consult" level of engagement, whereby activities focus on informing the community and gathering information to shape project outcomes.

An Airport Work Group (AWG) will be established for the MP Update to provide meaningful input on technical issues and related polices by reviewing prepared working papers developed as part of the airport planning process. AWG membership will include tenant representatives, stakeholders from the Airport Roundtable and representatives from other business, labor, economic development, community and environmental interests. The working papers will be discussed in a series of AWG meetings, and members

[1] See King County Community Engagement Guide (2011).

may offer comments and other input to address their constituents' interest and/or concerns. The AWG's feedback will be considered by the Planning Team and incorporated into the ongoing MP Update documentation. In addition to the AWG, an Airport Partners group will also be established to gain access to jurisdictional perspectives, technical and community relations resources, coordination across policy and land use regulations, and other emerging issues related to the Master Plan update. King County will convene these partners at project milestones and distribute working papers to keep them informed of project progress; however, this group will not represent the community at large.

Regular project updates will also be provided to the DOT and FMD Directors, the County Executive, and King County Council, as well as other jurisdictional partners, with any resulting policy guidance to be shared with AWG members to support their ongoing reviews.

## Airport Role and Facilities

As illustrated in the following figures, entitled *AIRPORT LOCATION MAP*, and *AIRPORT VICINITY MAP*, BFI is located in King County, approximately four (4) miles south of downtown Seattle, adjacent to the regional transportation network that connects State Highways to Interstate Highways.

BFI is owned by King County, but operated, managed, and administered as a division of the County's Department of Transportation. This management structure includes the King County Executive, King County Council, and the Director of the King County Department of Transportation. The Airport Director and his staff of aviation professionals are responsible for the Airport operations and maintenance in order to meet required federal safety standards and serve as the Airport's public relations representative. The Airport Division is also served by an airport advisory board (i.e., Airport Roundtable) that consists of community representatives, airport tenants, Pilot's association, off-site businesses, and labor representatives. The Roundtable makes recommendations on airport matters to airport administrators, the King County Executive, and King County Council.

BFI, which is classified as a non-hub, primary commercial service airport by the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS), is also one of five (5) general aviation (GA) reliever airports to Seattle-Tacoma International Airport (SEA), within the Puget Sound Airport System that includes twenty (20) public-use general aviation airports and two (2) military airfields. The close proximity of BFI to both SEA and Renton Municipal Airport (RTN) (i.e., BFI is separated from the two airports by approximately 4 miles) imposes some unique air traffic control challenges with regard to airspace constraints/congestion and instrument approach procedure management that will be described in later sections of this document.


FIGURE A1 **Airport Location Map**

Mead & Hunt

**King County International Airport/ Boeing Field**

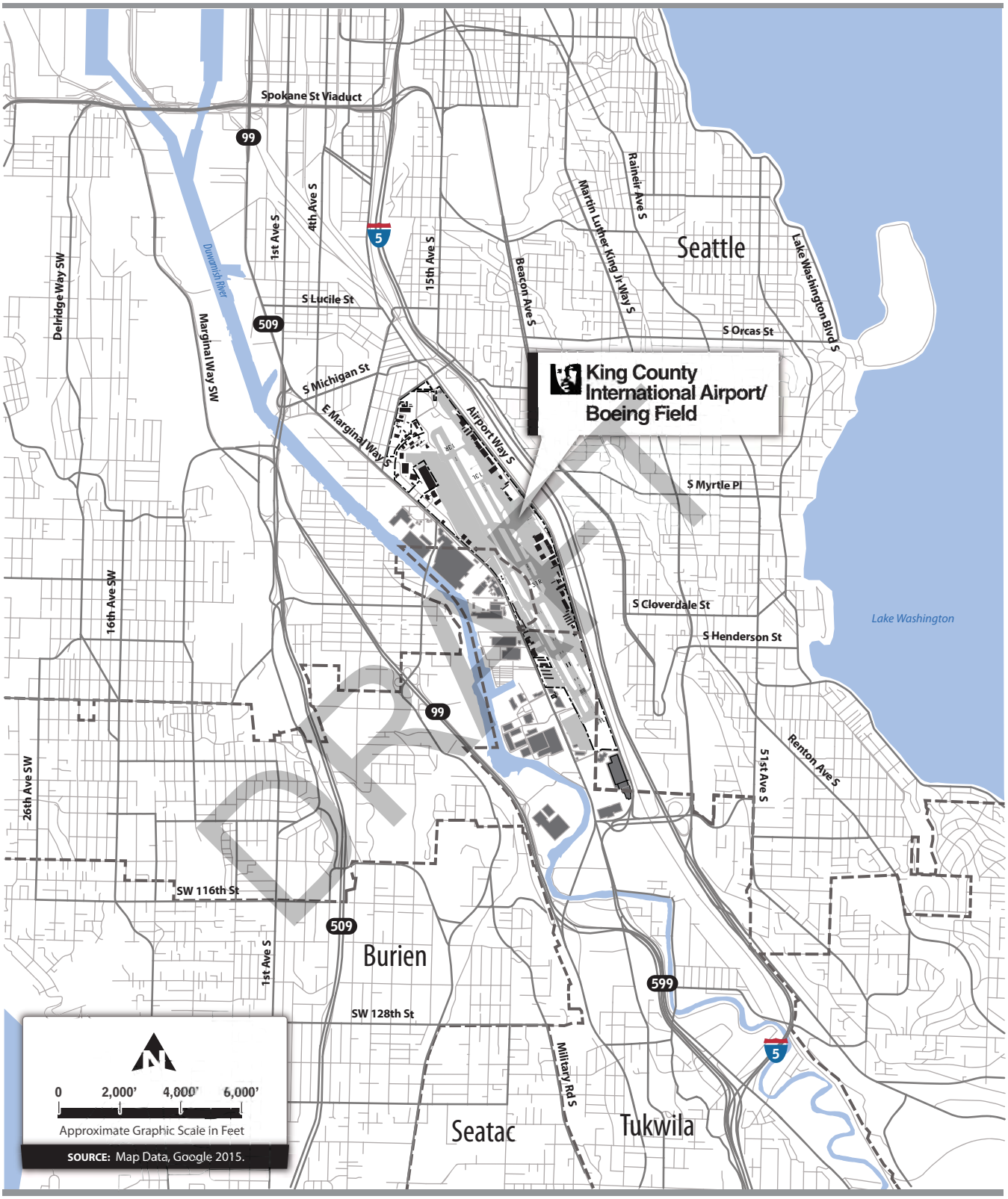


FIGURE A2 **Airport Vicinity Map**

Mead &Hunt

**King County International Airport/ Boeing Field**

BFI is the busiest GA reliever to SEA, but has recorded a significant drop in annual operations performed by the smaller GA aircraft fleet (e.g., local GA operations have declined 55% at BFI between 2006 and 2015). This operational decline is not unique to BFI, with GA activity decreasing at many of the regional airports and around the country, due to the steadily rising costs of owning and operating an aircraft. However, the Airport continues to be a prime location for the basing of corporate GA aircraft and air cargo operations, due to the close proximity with the Seattle Central Business District and the adjacent network of regional transportation facilities.

## Airside Facilities

BFI is operated with two runways that are parallel, oriented in a general northwest-southeast direction, and supported by a system of parallel and connecting taxiways. Figure A3, entitled *EXISTING AIRPORT LAYOUT,* provides a graphic presentation of the existing airport facilities. Additional airport information includes:

- ***Airport Reference Point:*** **Latitude N 47° 31' 48.00" and Longitude W 122° 18' 7.10" (estimated)**
- ***FAA Site Number:*** **26396.A**
- ***Airport Elevation:*** **21.0 feet above mean sea level (AMSL)**
- ***Acreage:*** **594.0 acres**
- ***Mean Normal Temperature of hottest month:*** **75.3° F (July & August).**

### Runways

**Runway 13R/31L (Primary).** Runway 13R/31L, the Airport's primary runway, is 10,000 feet in length, and 200 feet in width and has an existing 880-foot displaced landing threshold to Runway 31L. This displaced threshold and associated application of declared distances criteria results in the published declared distance lengths that are presented in the following table.

Table A1 **RUNWAY 13R/31L DECLARED DISTANCES**

| Facility | TORA | TODA | ASDA | LDA |
|---|---|---|---|---|
| Runway 13R[1] | 10,000' | 10,000' | 9,120' | 9,120' |
| Runway 31L[2] | 10,000' | 10,000' | 10,000' | 9,120' |

***SOURCE:*** *2007 Airport Layout Plan & Mead & Hunt, Inc.*
Note: The specified operational runway lengths reflect the existing condition.
TORA: Takeoff Run Available
TODA: Takeoff Distance Available
ASDA: Accelerate Stop Distance Available
LDA: Landing Distance Available

[1] The reduced ASDA and LDA lengths are dictated by RSA requirements at the departure end of runway (DER).

[2] The reduced LDA length is dictated by the existing displaced landing threshold.

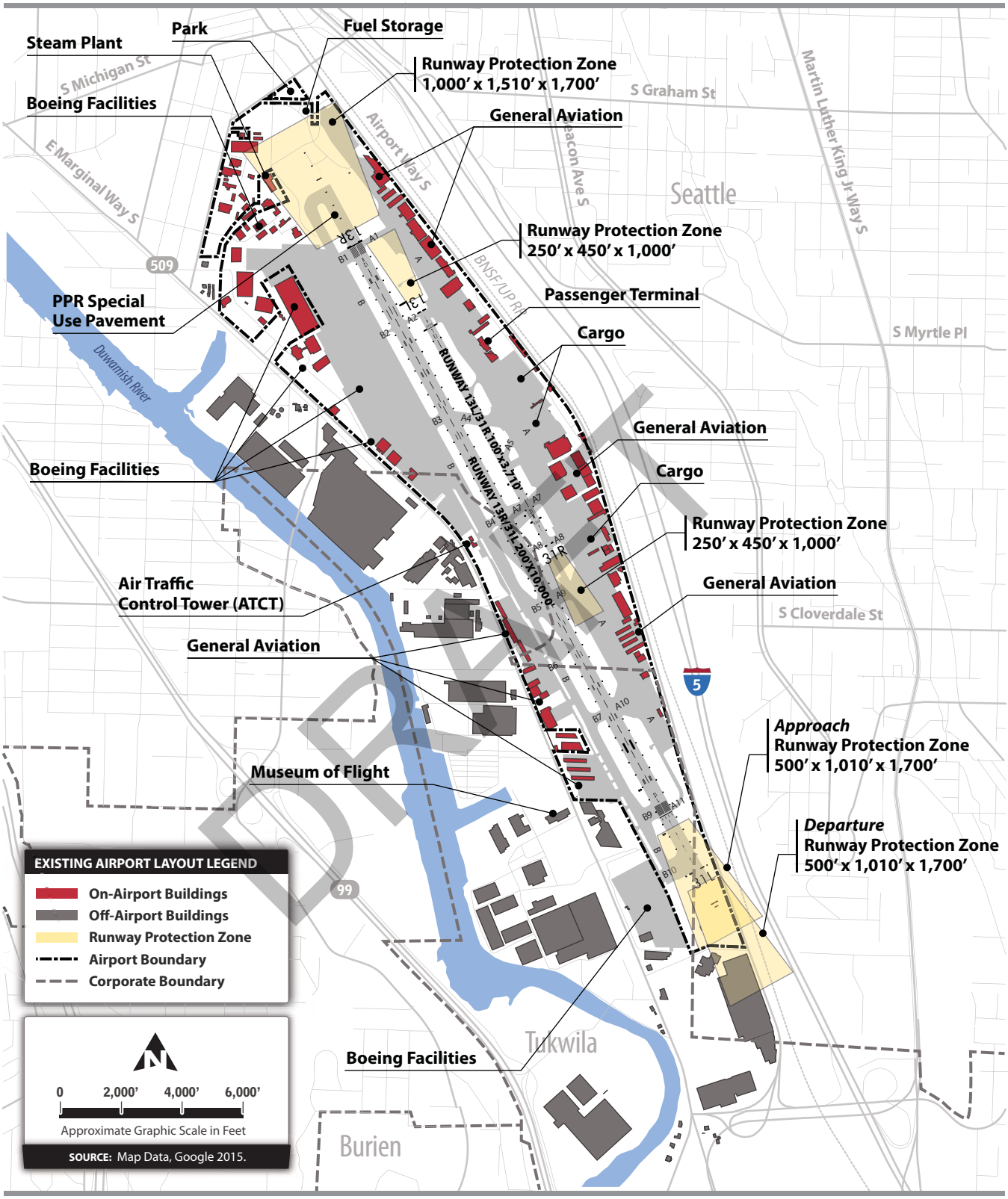


FIGURE A3 **Existing Airport Layout**

Mead & Hunt

**King County International Airport/ Boeing Field**

It should also be noted that an additional 880 feet of pavement is located at the north end of the runway, which is defined as Prior Permission Required Pavement (PPRP) runway on the current ALP. The PPRP runway, which is accessible via Taxiway "Z", is available (with ATC permission) for Runway 13R departures to those aircraft[2] requiring an ASDA runway length greater than 9,120 feet.

The runway is constructed of grooved asphalt, and has a gross weight bearing capacity of 100,000 pounds single wheel, 160,000 pounds dual wheel, and 340,000 pounds dual tandem wheel main landing gear configuration. The runway is equipped with High Intensity Runway Lights (HIRLs), a four-light Precision Approach Path Indicator (PAPI) on the left side of both runway ends, and is marked with precision approach runway markings. The Runway 13R end is served by an Instrument Landing System (ILS) approach that includes a glide slope, localizer, a Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF), and provides a *right hand* traffic pattern. Runway 31L, which provides a *left hand* traffic pattern, is also served by an ILS approach that includes a glide slope and localizer, but no approach lighting system.

**Runway 13L/31R (Secondary).** Located on the east side of the primary runway, the Airport's secondary parallel runway (Runway 13L/31R) is 3,710 feet in length, 150 feet in width and has existing displaced landing thresholds at each runway end. The Runway 13L landing threshold is displaced 250 feet, while the Runway 31R landing threshold is displaced 375 feet. The published declared distance lengths presented in the following table are the result of these displaced landing thresholds.

Table A2 **RUNWAY 13L/31R DECLARED DISTANCES**

| Facility | TORA | TODA | ASDA | LDA |
|---|---|---|---|---|
| Runway 13L[1] | 3,710' | 3,710' | 3,710' | 3,460' |
| Runway 31R[2] | 3,710' | 3,710' | 3,710' | 3,335' |

***SOURCE:*** *2007 Airport Layout Plan & Mead & Hunt, Inc.*

Note: The specified operational runway lengths reflect the existing condition.

TORA: Takeoff Run Available
TODA: Takeoff Distance Available
ASDA: Accelerate Stop Distance Available
LDA: Landing Distance Available

[1] The reduced ASDA and LDA lengths are dictated by RSA requirements at the departure end of runway (DER).

[2] The reduced LDA length is dictated by the existing displaced landing threshold.

This runway, which is currently limited to use by aircraft weighing up to 12.500 pounds and not available for air carrier operations, is constructed of grooved asphalt, and has a gross weight bearing capacity of 35,000 pounds single wheel and 60,000 pounds dual wheel main landing gear configuration. The runway is equipped with Medium Intensity Runway Lights (MIRLs), two-light PAPIs on the left side of each runway end, as well as REILs on both runway ends. In addition, Runway 13L/31R is a visual runway with basic runway markings, while Runway 13L provides a *left hand* traffic pattern and Runway 31R provides a *right hand* traffic pattern.

[2] These are typically represented by Boeing aircraft deliveries that require departures to long-haul international destinations.

## Taxiways

**Runway 13R/31L Taxiway System.** The east side of the primary runway is served by partial parallel Taxiway "A" and eight (8) of its eleven (11) connector/exit taxiways that are designed to varying standards and dimensions. This taxiway system is constructed primarily of asphalt, with some concrete panels, that vary in width from 35 to 430 feet. Taxiway "B" is the west side parallel taxiway serving Runway 18L/36R. This taxiway, which is constructed of asphalt, is 75 feet in width and provided with eight (8) connector/exit taxiways that are designed to varying standards and dimensions. A brief summary description of the features associated with this taxiway system is presented in the following table.

Table A3 **RUNWAY 13R/31L TAXIWAY SYSTEM**

| Taxiway | Type | Location | Width | Condition | Lighting/Signage |
|---|---|---|---|---|---|
| Taxiway "A" | Partial Parallel[1] | East Side | 50' - 75' | TBD | Yes/Yes |
| Taxiway "A-1" | Connector/Exit | East Side | 70' | TBD | Yes/Yes |
| Taxiway "A-2" | Connector/Exit | East Side | 40' - 135' | TBD | Yes/Yes |
| Taxiway "A-4" | Exit | East Side | 135' | TBD | Yes/Yes |
| Taxiway "A-7" | Connector/Exit | East Side | 130' | TBD | Yes/Yes |
| Taxiway "A-8" | Connector/Exit | East Side | 40' | TBD | Yes/Yes |
| Taxiway "A-9" | Connector/Exit | East Side | 200' | TBD | Yes/Yes |
| Taxiway "A-10" | Connector/Exit | East Side | 430' | TBD | Yes/Yes |
| Taxiway "A-11" [2] | Exit | East Side | 35' | TBD | Yes/Yes |
| | | | | | |
| Taxiway "B" | Parallel | West Side | 75' | TBD | Yes/Yes |
| Taxiway "B-1" | Connector/Exit | West Side | 200' | TBD | Yes/Yes |
| Taxiway "B-2" [2] | Exit | West Side | 30' | TBD | Yes/Yes |
| Taxiway "B-3" | Connector/Exit | West Side | 90' | TBD | Yes/Yes |
| Taxiway "B-4" | Exit | West Side | 90' | TBD | Yes/Yes |
| Taxiway "B-5" | Connector | West Side | 365' | TBD | Yes/Yes |
| Taxiway "B-7" | Exit | West Side | 100' | TBD | Yes/Yes |
| Taxiway "B-9" | Exit | West Side | 125' | TBD | Yes/Yes |
| Taxiway "B-10" | Connector/Exit | West Side | 275' | TBD | Yes/Yes |
| Taxiway "Z" [3] | Parallel/ Connector | West Side | 75' | TBD | Yes/Yes |

***SOURCE:*** *2007 Airport Layout Plan, 2015 Airport Imagery, & Mead & Hunt, Inc.*

[1] Full length extension of Taxiway "A" is not feasible due to proximity of existing airport boundary, adjacent public roadway and railway.

[2] Taxiway use is restricted Airplane Design Group (ADG) II/Taxiway Design Group (TDG) 2 aircraft.

[3] Taxiway "Z" is defined as PPRP which serves the PPRP runway at the north end of Runway 13R/31L.

**Runway 13L/31R Taxiway System.** The east side of the primary runway is served by parallel Taxiway "A" and six (6) of its eleven (11) connector/exit taxiways that are designed to varying standards and dimensions. This east side parallel taxiway system is constructed primarily of asphalt, with some concrete sections, that vary in width from 35 to 430 feet. Taxiway "B" is the west side parallel taxiway serving Runway 13L/31R. This taxiway, which is constructed of asphalt, is 75 feet in width and provided with eight (8) connector/exit taxiways that are designed to varying standards and dimensions. A brief summary description of the features associated with this taxiway system is presented in the following table.

Table A4 **RUNWAY 13L/31R TAXIWAY SYSTEM**

| Taxiway | Type | Location | Width | Condition | Lighting/Signage |
|---|---|---|---|---|---|
| Taxiway "A" | Partial Parallel[1] | East Side | 50' - 75' | TBD | Yes/Yes |
| Taxiway "A-2" | Connector/Exit | East Side | 40' - 135' | TBD | Yes/Yes |
| Taxiway "A-3" | Connector/Exit | East Side | 35' | TBD | Yes/Yes |
| Taxiway "A-4" | Exit | East Side | 135' | TBD | Yes/Yes |
| Taxiway "A-5" | Connector/Exit | East Side | 60' | TBD | Yes/Yes |
| Taxiway "A-7" | Connector/Exit | East Side | 130' | TBD | Yes/Yes |
| Taxiway "A-8" | Connector/Exit | East Side | 40' | TBD | Yes/Yes |
| | | | | | |
| Taxiway "B" | Parallel | West Side | 75' | TBD | Yes/Yes |
| Taxiway "B-2" [2] | Exit | West Side | 30' | TBD | Yes/Yes |
| Taxiway "B-3" | Connector/Exit | West Side | 90' | TBD | Yes/Yes |
| Taxiway "B-4" | Exit | West Side | 90' | TBD | Yes/Yes |

***SOURCE:*** *2007 Airport Layout Plan, 2015 Airport Imagery, & Mead & Hunt, Inc.*

[1] Full length extension of Taxiway "A" is not feasible due to proximity of existing airport boundary, adjacent public roadway and railway.

[1] Taxiway use is restricted Airplane Design Group (ADG) II/Taxiway Design Group (TDG) 2 aircraft.

## Landside Facilities

Landside facilities are defined as those airport facilities that are outside of the runway/taxiway system. Therefore, landside facilities typically include the passenger terminal building, passenger terminal support facilities, airport support facilities, aircraft storage and maintenance facilities, Fixed Base Operator (FBO) facilities, aircraft storage and parking aprons, along with automobile access and parking facilities, and other on-airport structures/use areas. A brief listing/description of the major landside facilities for King County International Airport/Boeing Field is provided in the following narrative.

### Aprons

There are five (5) major apron designations at King County International Airport/Boeing Field for aircraft parking and storage. The aprons are generally categorized as follows:

- **Passenger Terminal Apron**
- **Air Cargo Aprons**
- **Boeing Aircraft Apron**
    - **B-737 Flight Test Facility & Delivery Center**
    - **Military Flight Center & Test Facility**
- **General Aviation Aprons**

**Passenger Terminal Apron.** Consisting of about 1.6 acres, the passenger terminal apron is located on the west side of the passenger terminal building. Use of this apron is currently shared between Kenmore Air (providing commercial passenger service with Cessna 208 Caravans), AIRPAC Airlines (providing contract courier service with a freighter fleet of Piper PA-31 Chieftain and Piper PA-34 Seneca II aircraft), international aircraft operations that require Federal Inspection Services provided by the U.S. Customs Service, and Justice Prisoner & Alien Transportation System (JPATS) aircraft providing government operated scheduled passenger service for prisoners and criminal aliens. This apron area is in excellent condition, with existing pavement strengths that are comparable to the various taxiways and taxilanes that serve it.

**Air Cargo Aprons.** In addition to a portion of the passenger terminal apron that is used for air cargo, there are two (2) designated air cargo aprons located at BFI. Each are located on the east side of the Airport, and provided with direct roadway access to Airport Way South. The first, consisting of about 11.6 acres, is located southeast of the passenger terminal building (identified as Apron 8 on the ALP) and primarily utilized by United Parcel Service (UPS). The second cargo apron area (identified as Apron 10 and consisting of about 4.7 acres) is located further to the southeast (adjacent to the Runway 31R threshold) and primarily utilized by BAX Global[3]. Each of the apron areas are in fair condition, with existing pavement strengths that are comparable to the various taxiways that serve them.

**Boeing Aircraft Apron.** There are two large apron areas associated with existing Boeing facilities that are located on the west side of the Airport. The first, consisting of about 33.8 acres that accommodates approximately twenty-seven aircraft parking positions and supporting taxilanes, extends from the north end of the Runway 13R/31L to just south of the Taxiway "B-3" connector taxiway, and is utilized by Boeing to support their B-737 Flight Test Facility & Delivery Center operations. This area is identified as Apron 1 on the current ALP. The second Boeing apron area, consisting of about 15.7 acres that accommodates approximately nine aircraft parking positions and supporting taxilanes, is located adjacent to the Runway 31L threshold) and utilized to support their Military Flight Center & Test Facility operations. It should be noted that this second area is located outside the current airport boundary, but provided airside access to the west side parallel taxiway (Taxiway "B") via the Taxiway "B-10" connector. Each of the apron areas are in good to excellent condition, with existing pavement strengths that are comparable to the various taxiways that serve them.

**General Aviation Apron.** There are several apron areas associated with the various commercial and corporate general aviation facilities located on the Airport. They are generally concentrated along the east side of the Airport in conjunction with the existing FBO facilities (i.e., Signature Flight Support @ Aprons 4-6, Clay Lacy Aviation @ Apron 9, and Kenmore Aero Services @ Apron 11), but also includes the Northeast Apron, Apron 12 at the south end, and Apron 2 on the west side of the Airport (located just north of the Museum of Flight).

In addition, there are a total of eleven (11) aircraft de-icing/wash pads located on the various apron areas at BFI. Four of the pads (two located on each side of the Airport) are identified for public use. In addition, there are seven tenant-controlled pads, five located on the east side of the Airport and two located on the west side of the Airport that are controlled by the Boeing Company. The location of these various de-icing/wash

[3] The existing BAX Global cargo operation is currently scheduled to relocate to SEA in late 2016.

pads and the primary apron areas are presented on the following illustration, entitled *BFI APRON AREAS & AIRCRAFT DE-ICING/WASH PADS.*

## Hot Spots

The FAA defines a "hot spot" as a safety-related problem area on an airport (generally represented by a complex or confusing taxiway system, runway system, or runway/taxiway intersection) that poses an increased risk for runway incursions or incidents during aircraft surface operations. The typical causes of hot spot-related runway incursions or incidents can be attributed to airfield layout, traffic flow, airport marking/signage/lighting, situational awareness, and training.

According to FAA's current *Runway Safety Hot Spots List*, there are two documented hot spots at BFI. Hot Spot #1 is located at the intersection Taxiway "B-1" and is associated with the restricted access to the Taxiway "Z" PPRP. Hot Spot #2 is located at the intersection of Taxiway "A-9" and Runway 13R/31L and has been identified as a risk for wrong way departures. Each of these existing hot spot locations are identified on the following figure, entitled *EXISTING AIRPORT HOT SPOTS*.

## Passenger Terminal Area Complex

The passenger terminal complex at BFI is located on the east side of the Airport, and southeast of the Runway 13L landing threshold. The passenger terminal building underwent a comprehensive rehabilitation project in 2002, and complies with the design provisions set forth in the Americans with Disabilities Act of 1990. The remainder of the terminal complex is composed of access roadways, public/employee surface parking. The existing layout of the passenger terminal building is presented on Figure A6, entitled *EXISTING PASSENGER TERMINAL AREA SITE PLAN*.

**Passenger Terminal Building.** The passenger terminal building consists of two levels. The lower level, which consists of over 15,000 square feet, is occupied by various tenants: one commuter airline operator - Kenmore Air, one of the air cargo carriers-AIRPAC Airlines, U.S. Customs & Immigration facilities, and a small coffee shop/deli. The upper level, consisting of over 10,000 square feet, is utilized by King County Airport Management and Operations Staff, which includes offices and conference room facilities.

The terminal's existing airline facilities include airline counters, departure and arrival lounges, baggage make-up and claim areas, and airline offices. Since Kenmore Air provides commercial passenger service with aircraft that do not exceed the 12,500 pound weight classification or loadings in excess of 30 passengers, the airline and airport are not required to provide a security program that is administered by the Transportation Security Administration (TSA).

The terminal curb is approximately 250 linear feet in length and is served by a one-way, looped roadway (King County Airport Access Road) that is linked with the Airport Perimeter Road. The terminal parking facilities (serving both passengers and employees) are located directly northeast of the terminal building and provide ground level parking for 207 vehicles. The existing parking area is uncontrolled and free to airline passengers and employees of the terminal.

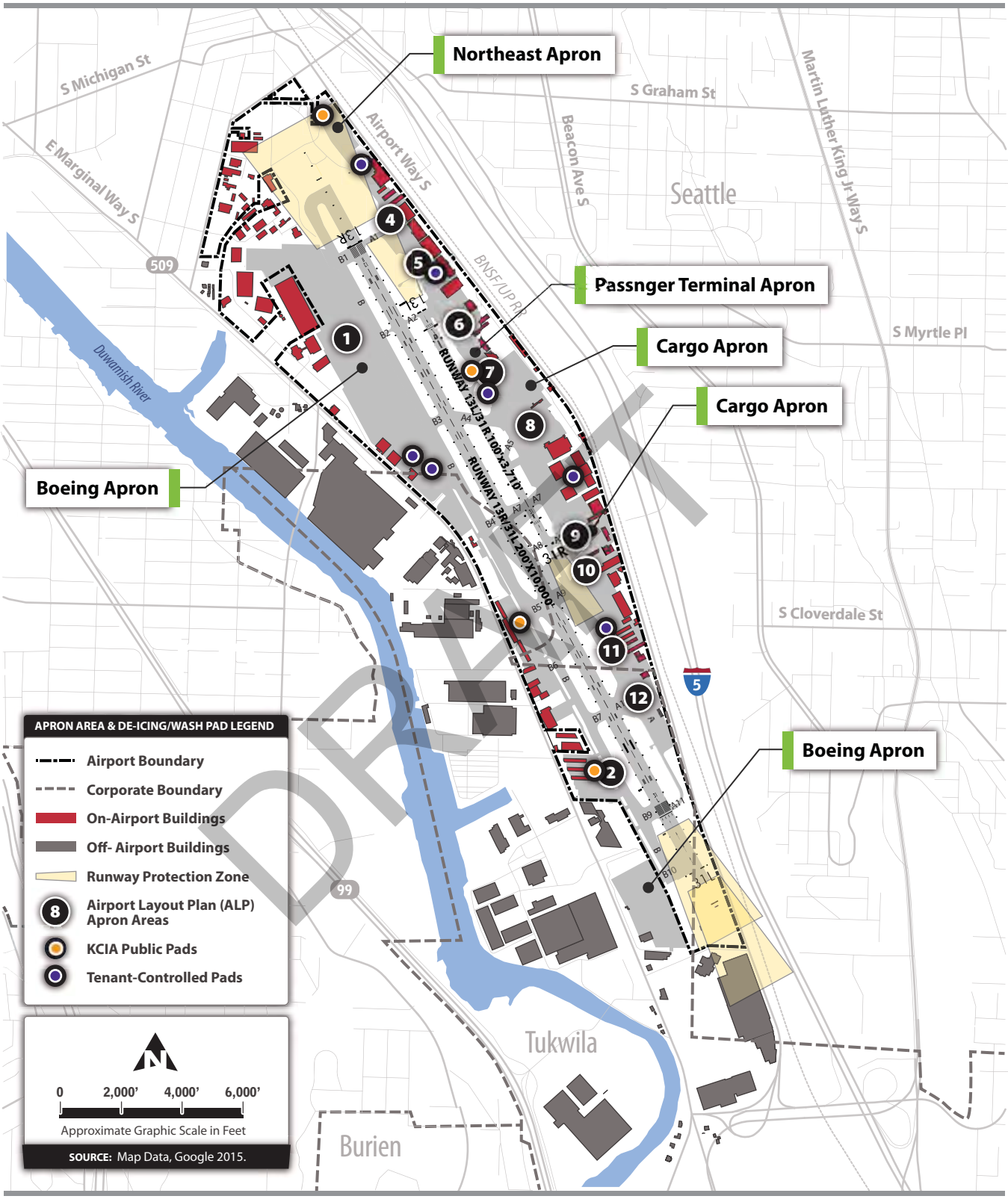


FIGURE A4 **Existing Apron Areas & Aircraft De-Icing/Wash Pads**

Mead & Hunt

**King County International Airport/ Boeing Field**

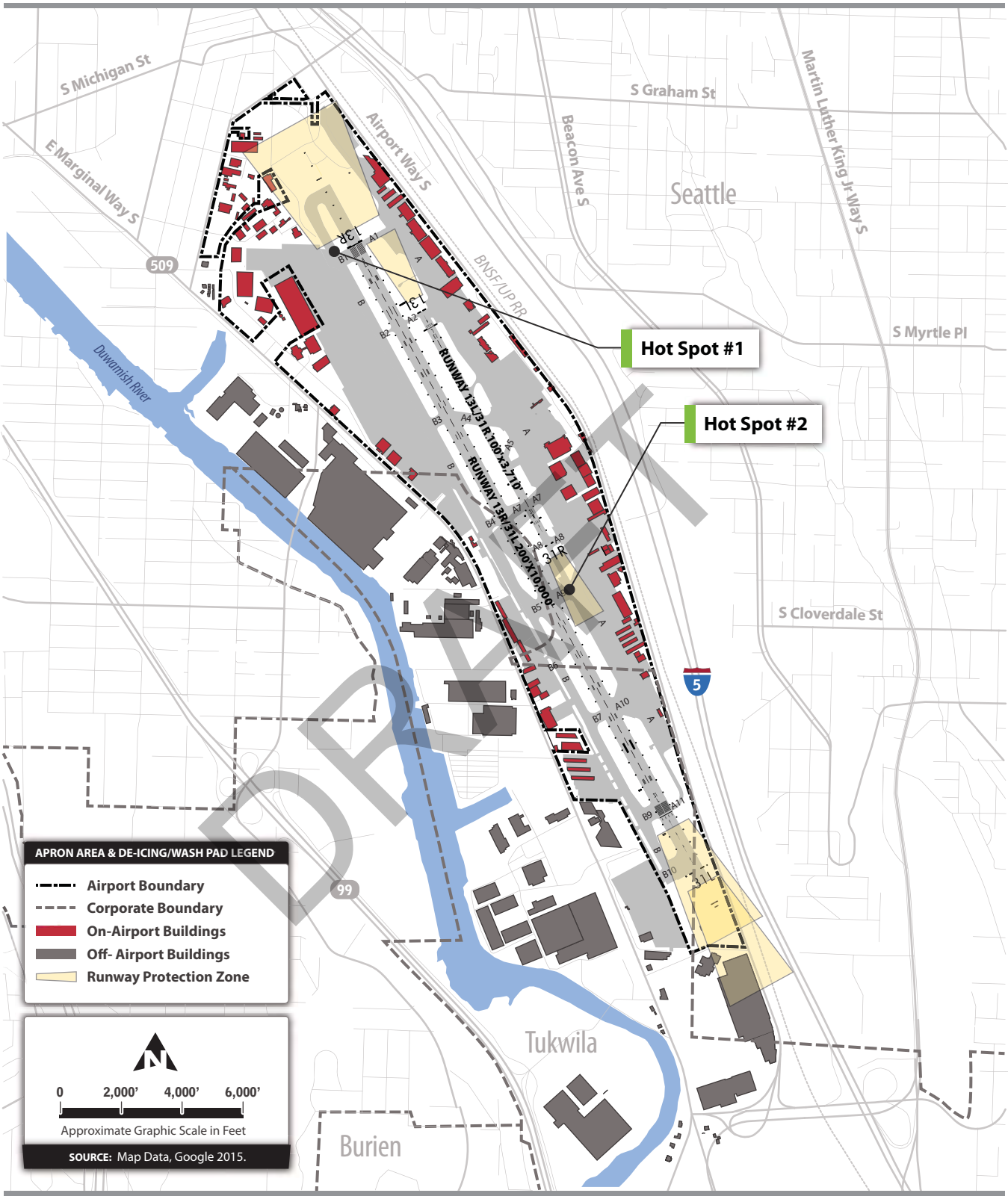


FIGURE A5 **Existing Airport Hot Spots**

Mead & Hunt

**King County International Airport/ Boeing Field**

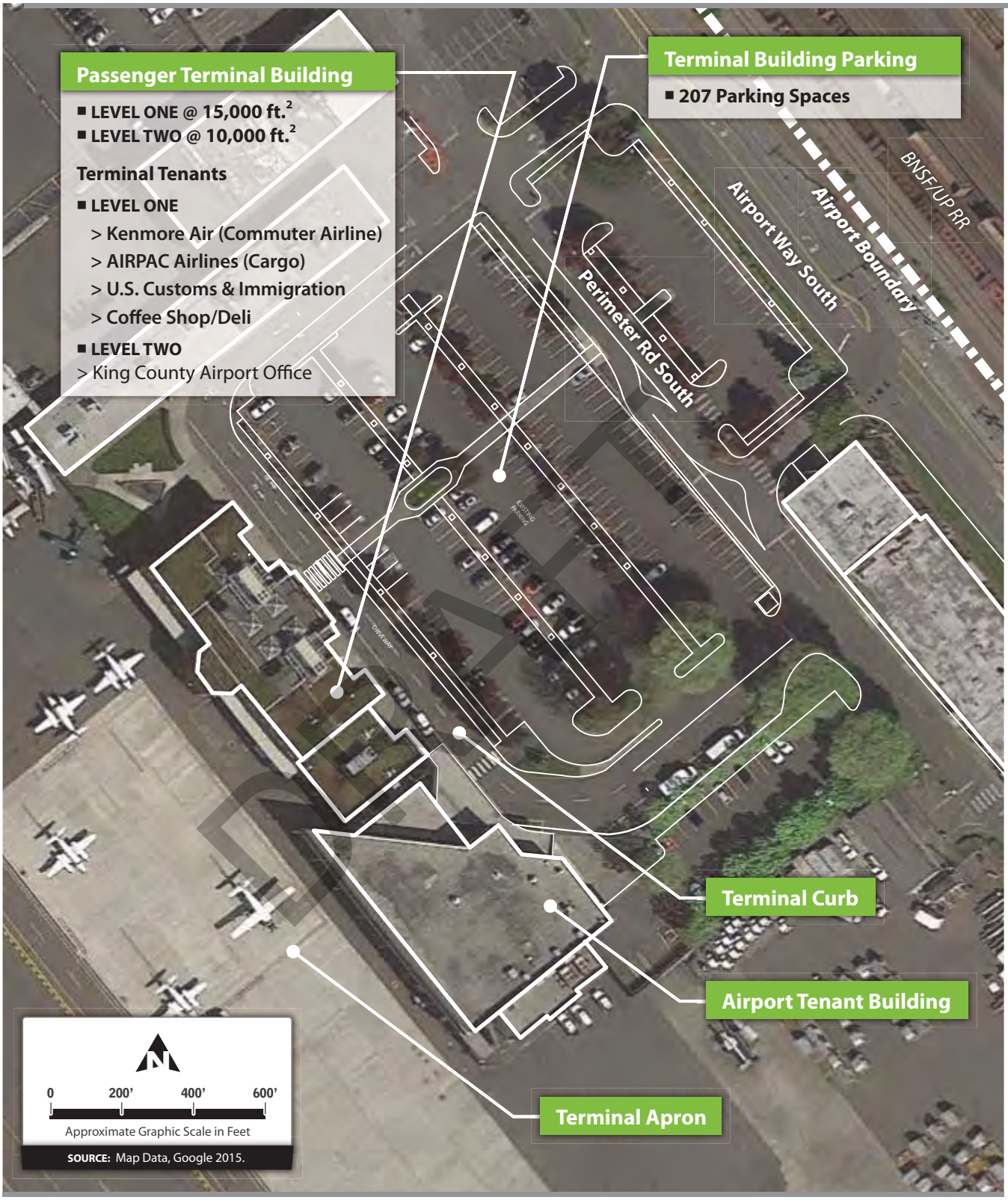


FIGURE A6 **Existing Passenger Terminal Area Site Plan**

Mead & Hunt

**King County International Airport/ Boeing Field**

**U.S Customs Service and Border Protection Facilities.** Federal Inspection Services (FIS) are provided by the U.S. Customs Service and their offices at BFI are located in the lower level/southern portion of the Passenger Terminal Building, with the U.S. Customs apron area located adjacent to the west side of the building. Facilities include queuing/waiting areas, holding areas, stainless steel inspection counters, restrooms, and offices for Customs, Immigration and Naturalization Service (INS), and USDA inspection personnel.

U.S. Customs control the entry and clearance of aircraft arriving into the United States and inspect the crew, passengers, baggage, stores, and cargo carried thereon. Commercial carriers must request landing rights in advance in writing, post an international carrier's bond in an amount established by Customs, and transmit the crew and passenger data electronically to Customs. As an Airport of Entry (AOE), BFI Customs requires two hours of prior notification, and provides customs and immigration services for incoming flights, serving as an initial port of entry for foreign visitors arriving in the United States. The INS operations at BFI include the transport of criminal aliens within and from the U.S. by the Bureau of Immigration and Customs Enforcement (ICE) via the Justice Prisoner & Alien Transportation System (JPATS). JPATS is the only government-operated, regularly scheduled passenger airline in the nation that operate a fleet of aircraft to transport prisoners more economically and with higher security than commercial airlines.

## Aviation Industrial/Maintenance Facilities

These type of aviation facilities at BFI are currently highlighted by the Boeing Company's various civilian and military aircraft Flight Test and Delivery Center operations, but also includes a significant number of ancillary aviation manufacturing business that specialize in aircraft subassemblies and interiors. A brief description of the two primary Boeing facilities/operations at BFI is presented in the text below.

**Boeing 737 Flight Test Facility & Delivery Center.** The Boeing Commercial Airplane Group assembles all lines of the B-737 aircraft at a large manufacturing facility located adjacent to the Renton Municipal Airport, which is located less than five miles to the southeast of BFI. Following an initial first flight from Renton, all of the B-737s are landed at BFI to undergo final flight testing/finishing, and ultimately delivered to the customer via the newly expanded B-737 Delivery Center. Additional facilities include a large apron area, hangars, and various support facilities. Currently Boeing produces approximately 42 B-737 aircraft a month, or 504 aircraft a year, at the Renton facility. According to company forecast projections, this production rate is programmed to increase to 52 aircraft per month, or 624 aircraft per year by 2018. Current B-737 delivery data from the Boeing website through March of 2016 totaled 121 aircraft, which averages to just over 40 aircraft per month for Q1 of 2016.

In addition, Boeing is the major lease holder at the Airport with approximately 106 acres located in the northwest quadrant of the Airport (consisting of apron, hangars, and offices) that are associated with the B-737 facilities and operations. However, Boeing also has existing facilities located adjacent to the BFI apron, but outside the Airport boundary (i.e., approximately 16 acres), which are accessed via a "through-the-fence" agreement with the Airport. An additional 95.85 acres of Boeing property, with office and parking support facilities, is located on the west side of E. Marginal Way S.

**Military Flight Center & Test Facility.** The Boeing Company also operates a separate Flight Center and Test Facility, located at the southwest corner of the Airport, to serve various military versions of the aircraft they manufacture [e.g., the Boeing P-8 Poseidon, Boeing E-3 Sentry (AWACS), the new Boeing KC-46 Pegasus,

etc.]. The facilities include a large apron area, hangars, and various support facilities. Beginning in late January 2016, Boeing began an extensive 9-month testing program at BFI for the KC-46 Pegasus (a widebody, multi-role tanker aircraft) that includes daily operations by two Navy F-18 jets that are part of the refueling training exercise.

As with a portion of the B-737 facilities at the north end of the Airport, a portion of these military facilities, consisting of approximately 20.2 acres, are provided airfield access using the Taxiway "B-10" connector via a "through-the-fence" agreement with the Airport. An additional 98.42 acres of Boeing property in this area is located on the west side of E. Marginal Way S., and provided with large hangar, office and parking support facilities. The Airport also maintains a separate aircraft access lease with Boeing for the occasional movement of aircraft from airport property, via the Taxiway "B-6" connector, west across E. Marginal Way S. to existing off-airport Boeing facilities.

## Air Cargo Facilities

The BFI air cargo activity is currently represented by eight (8) carriers that operate a variety of aircraft, ranging in size from smaller general aviation (e.g., the Piper Chieftain PA-31) operated by AIRPAC Airlines to large widebody air carrier aircraft (e.g., B-767-300F) operated by UPS. Based upon calendar year data for 2014, BFI ranked as the 27th busiest cargo airport in the country, with a recorded air cargo landed weight of 407,629 tons, representing an increase of 7.35% from 2013 data.

Air cargo freight and mail facilities are currently concentrated at three areas along the east side of the airport property. The first area, located in and adjacent to the passenger terminal, is associated with AIRPAC Airlines that leases space in the north end of the terminal building and adjacent apron area. The second cargo area (utilized exclusively by UPS and Ameriflight) is located just south of the terminal and consists primarily of apron area, accommodating parking positions for four (4) large air carrier aircraft and several smaller aircraft, as well as a variety of small storage/office buildings and vehicle parking/cargo transfer areas. The third cargo area (utilized exclusively by BAX Global) is located further to the southeast (adjacent to the Runway 31R threshold) and consists primarily of apron area, accommodating parking positions for two (2) large air carrier aircraft, as well as a storage/office building and vehicle parking/cargo transfer areas. As noted previously, the existing BAX Global cargo operation is currently scheduled for relocation to SEA in late 2016.

## Washington Army National Guard Facilities

There is one Washington National Guard (WANG) Unit (i.e., the 81st Brigade Combat Team) that is located and operates from BFI property. A brief description of their operation, as described at the Washington National Guard website: http://mil.wa.gov/81st-brigade, is provided in the following text.

**81st Brigade Combat Team.** Headquartered in Seattle, but with units spread across the state, the 81st Brigade Combat Team (BCT), is recognized as the premier separate brigade in the Army, meeting or exceeding all readiness goals and fully prepared to deploy and execute our federal and state mission requirements. Units of the 81st Brigade Combat Team:

- 1-161st Infantry Regiment
- 3-161st Infantry Regiment

- 2-146th Field Artillery Regiment
- 181st Brigade Support Battalion
- 898th Brigade Engineer Battalion
- 1-185th Armor Regiment (California)

The Federal Mission is to deploy to a post-mobilization training site and, upon validation, to a designated contingency area of operations by sea, land, or air; and prepares for combat. On order, the Brigade conducts combat operations as part of a designated contingency force headquarters. The State Mission is to support the civil agencies that have the primary responsibility to protect life and property, and preserve the peace, order and public safety.

This WANG base at BFI, which consists of about 7.6 acres, is located in the far northwest portion of the Airport and provided direct vehicular access from Ellis Avenue South via South Willow Street and South Warsaw Street. The Base includes a variety of parking areas for both civilian autos and military vehicles, as well as administrative buildings, industrial/service buildings, and numerous base support facilities. The existing land lease for the WANG property expires in the year 2023.

## General Aviation Facilities

The majority of existing general aviation facilities at BFI are located on the east side of the Airport and represented by a combination of commercial and corporate hangar development areas that are provided with direct access to the east side parallel taxiway system (Taxiway "A").

The Airport is served by three (3) full service Fixed Base Operators that provide aircraft fuel, maintenance, aircraft storage, and charter services. These include:

- **Signature Flight Support** (located near the north end of the Airport, just east of the Runway 13L threshold)
- **Clay Lacy Aviation** (located near the midfield of the Airport, just east of the Runway 31R threshold)
- **Kenmore Aero Services** (located at the south end of the Airport, just east of Taxiway "A-10"connector)

The Airport is also home to several Aviation Service Operators (ASOs) that provide specialty aviation services/maintenance and charters, as well as numerous corporate aircraft operators that have existing hangar and flight department facilities at BFI.

## Aviation-Related Commercial Facilities

**Museum of Flight.** The Museum of Flight (MOF) facilities are located on 20.8 acres of property adjacent to the Airport, with approximately 75% of the acreage being located just east of the approach end to Runway 31L, and the balance of the property being located on the west side of East Marginal Way South. The MOF currently leases approximately 1.5 acres of airport property, but the majority of museum facilities are located on property outside the boundary of the Airport. According to the MOF website, the mission of the Museum

is "to acquire, preserve, and exhibit historically significant air and space artifacts, which provide a foundation for scholarly research, and lifelong learning programs that inspire an interest in and understanding of science, technology, and the humanities". Public automobile parking areas are located on the east and south side of the museum complex, which are accessed via East Marginal Way South. The existing museum apron area is also provided with airside access to Taxiway "B" (i.e., the west side parallel taxiway system serving Runway 13R/31L.

## Airport Support Facilities

**Fuel Storage Facilities.** As noted previously, the Airport is currently served by three (3) Fixed Base Operators (FBOs) that offer aircraft fueling services and products ranging from Avgas, Jet A, Military Jet fuel, unleaded, and diesel. The FBO fuel storage/dispensing facilities are sited at various locations on airport property, which includes facilities for self-fuelers of corporate aircraft, as well as fuel storage for automobiles in support of the Boeing facilities and airport maintenance operations. The location of the various fuel storage/dispensing facilities located on airport property are depicted on the following illustration, entitled *AIRPORT FUEL STORAGE/DISPENSING FACILITIES*, and a summary of the fuel types and tank sizes are presented In the following table.

Table A5 **EXISTING BFI AVIATION FUEL STORAGE FACILITIES**

| FUEL TYPE | Tank Size/Type | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 12,000/ UST | 15,000/ UST | 20,000 UST | 30,000/ UST | 100/ AST | 5,000/ AST | 12,000/ AST | 15,000/ AST | 30,000/ AST | TOTAL (GALLONS) |
| **AVGAS** | - | 1 | 1 | - | - | - | - | - | - | |
| Sub-Total (Gallons) | - | 15,000 | 20,000 | - | - | - | - | - | - | **35,000** |
| **JET A** | - | 2 | 14 | 1 | 1 | 2 | 1 | 3 | 4 | |
| Sub-Total (Gallons) | - | 30,000 | 280,000 | 20,000 | 100 | 10,000 | 12,000 | 45,000 | 120,000 | **517,100** |
| **UNLEADED** | 1 | - | - | - | - | - | - | 1 | 1 | |
| Sub-Total (Gallons) | 12,000 | - | - | - | - | - | - | - | - | **12,000** |

***SOURCE:*** *Airport Staff & Mead & Hunt, Inc.*

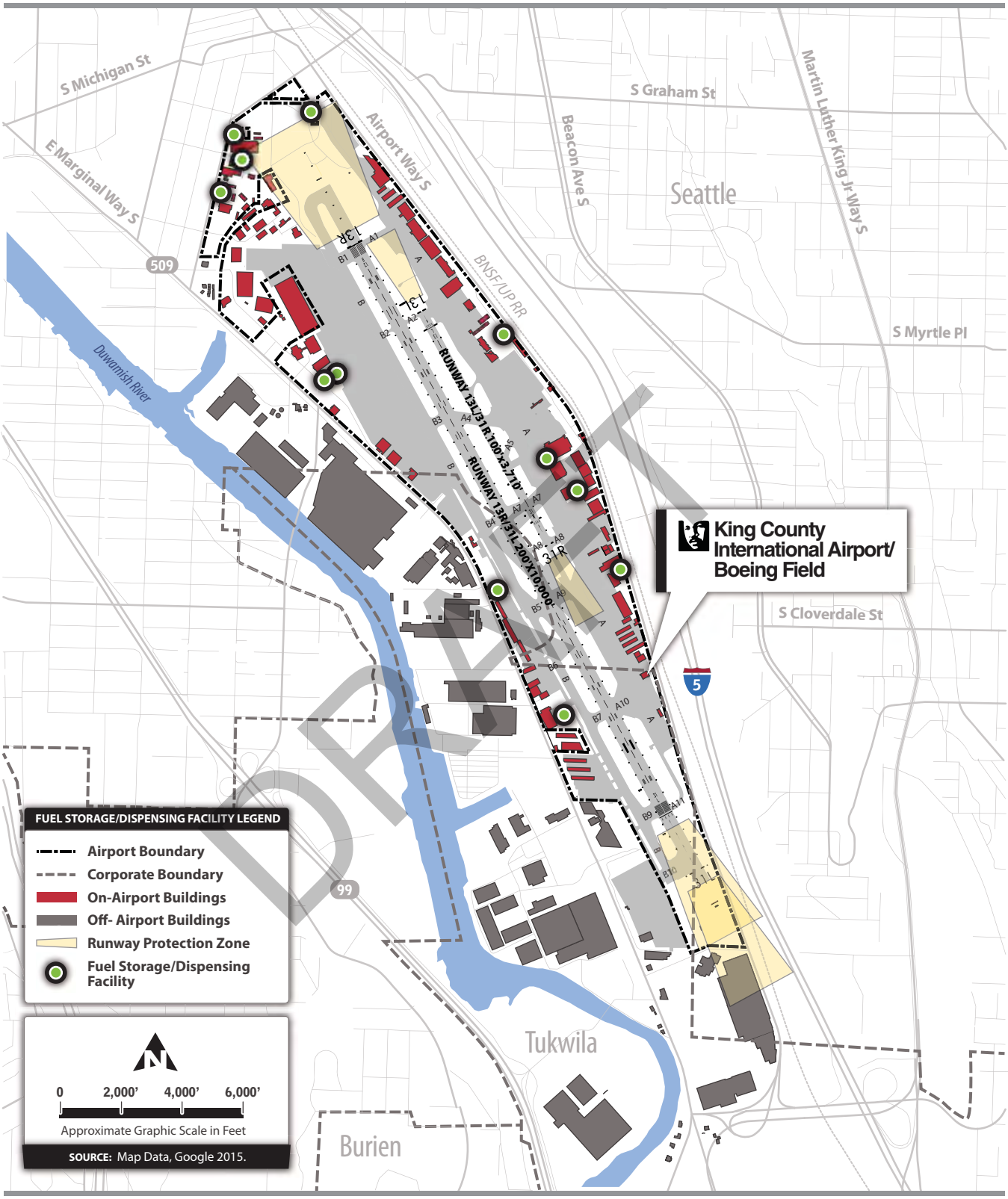


FIGURE A7 **Airport Fuel Storage/ Dispensing Facilities**

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**King County International Airport/ Boeing Field**

Fuel sales by month for calendar year 2015, as well as total fuel sales for 2010-2015, are shown in the following table entitled *BFI FUEL SALES, 2016-2015*.

Table A6 **BFI FUEL SALES, 2006 - 2015**

| Month | AVGAS (Gallons) | JET A (Gallons) |
|---|---|---|
| January | 18,164 | 1,665,552 |
| February | 26,084 | 1,742,357 |
| March | 30,640 | 2,121,432 |
| April | 18,100 | 2,154,670 |
| May | 44,487 | 2,026,450 |
| June | 32,934 | 1,936,950 |
| July | 30,594 | 2,344,064 |
| August | 36,879 | 2,219,692 |
| September | 38,375 | 2,144,105 |
| October | 33,753 | 2,203,853 |
| November | 27,563 | 1,913,105 |
| December | 16,720 | 1,827,769 |
| **2015 Totals** | 354,293 | 24,299,999 |
| | | |
| **2014 Totals** | 416,558 | 26,042,174 |
| **2013 Totals** | 449,761 | 22,888,718 |
| **2012 Totals** | 518,126 | 22,937,964 |
| **2011 Totals** | 655,792 | 31,397,305 |
| **2010 Totals** | 657,641 | 26,197,243 |
| **2009 Totals** | 664,985 | 23,983,112 |
| **2008 Totals** | 761,345 | 26,108,019 |
| **2007 Totals** | 764,753 | 25,153,904 |
| **2006 Totals** | 780,345 | 20,723,831 |

***SOURCE:*** *Airport Staff & Mead & Hunt, Inc.*

**Aircraft Rescue and Fire Fighting (ARFF) Facilities.** The ARFF facility at BFI, which is currently being reconstructed, is located at mid-field, on the west side of the Airport (adjacent to the ATCT and across from the Taxiway "B-4" connector). The new ARFF building is scheduled for completion in late 2016. During the construction project ARFF services are being provided from an existing temporary facility located at the southeast corner of the Airport. Once the new ARFF building is compete, the temporary facility will be removed from airport property.

In accordance with FAA Part 139 guidelines, BFI is designated as a Class II airport, which means an airport certificated to serve scheduled operations of small air carrier aircraft and the unscheduled passenger operations of large air carrier aircraft. Index A ARFF facilities and equipment are provided at the Airport, as required, to serve the existing type and number of air carrier aircraft operations. An Index A ARFF facility is required at an airport that has five (5) or more daily departures by air carrier aircraft with lengths less than 90 feet. The permanent ARFF facility site is provided with excellent access to the airfield via the west side parallel taxiway system (i.e., Taxiway "B") and vehicular access to E. Marginal Way S.

**Airport Traffic Control Tower (ATCT).** The BFI Airport Traffic Control Tower (ATCT) is also located at mid-field, on the west side of the Airport (adjacent to the ARFF building described above). The ATCT is defined as a "Tower with Display (VFR)" with Class B airspace that is operated by FAA personnel twenty (24) hours daily. It should be noted that an ATCT Line of Sight Shadow Study was prepared for BFI in 2006 utilizing FAA's "ATC Visibility Tool". Based upon this assessment, it was determined that all areas of the airfield within the Airport Operations Area (AOA) defined "visibility zone" maintain a clear Line of Sight for the ATCT controller.

**Weather Monitoring Equipment.** BFI is served by an Automated Surface Observing System (ASOS), which is located at the north end of the field, just south of the BFI fuel storage facility and east of the Runway 13R localizer antenna. This facility measures the following weather parameters: visibility, sky condition (cloud amount and height up to 12,000 feet), obstructions to vision (haze, fog), wind (direction, character, and speed), precipitation accumulation, ambient and dew point temperatures, pressure, and basic current weather information (type and intensity for freezing rain, rain, and snow). The ASOS provides a minute-by-minute update to pilots by calling the station at (206) 763-6904.

**Airport Maintenance Facilities.** The Airport's maintenance facility development area is located at the northeast corner of the airfield, southwest of the Runway 13R localizer antenna. The development area, which consists of 3.75 acres, includes a large storage facility and an adjacent yard area for bulk storage of materials and equipment, as well as fuel storage and dispensing facilities. Public vehicular access is provided via South Warsaw Street, which extends east from Ellis Avenue South. Airside vehicular access is provided via the Airport's perimeter roadway system that connects directly to the east and west side parallel taxiway system.

**On-Airport Utilities.** The mapping of existing utilities at BFI was obtained from Airport Staff and reflects the location/service provider of existing electricity (Seattle City Light), water (Seattle Public Utilities/City of Tukwila), wastewater (City of Tukwila/King County Metro), natural gas (Puget Sound Energy), internet (Comcast), and telephone (CenturyLink). The location of these facilities, which are depicted on the following illustration, will be evaluated in consideration of the planning of future development projects resulting from this MP Update.

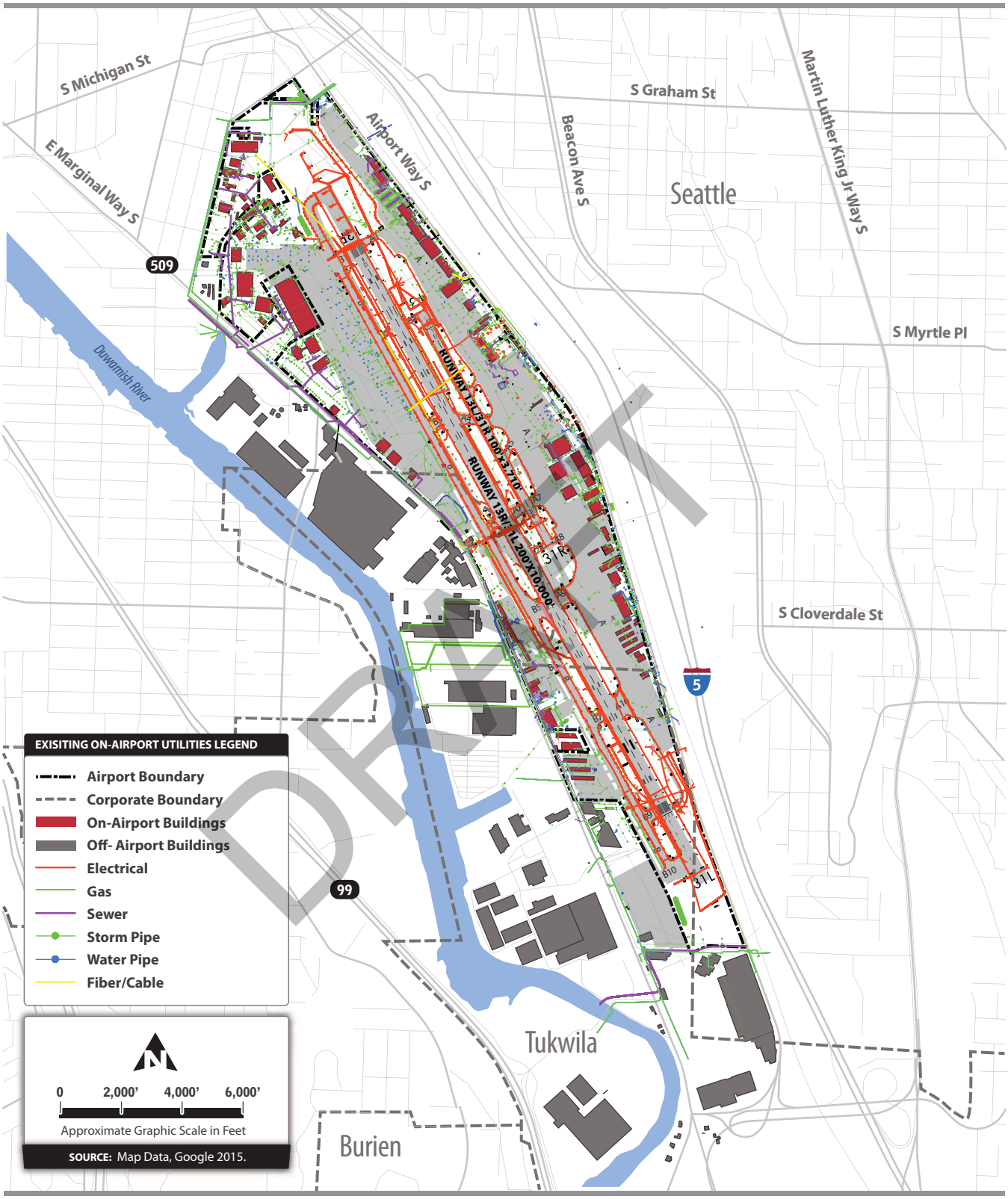


FIGURE A8 **Existing On-Airport Utilities**

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**King County International Airport/ Boeing Field**

## Transportation Facilities

Vehicular access is an important transportation component in the overall ability of an airport to function properly. Not only is it vital that passengers have easy access to and from the terminal area using ground transportation, but also surface transported freight must be easily shipped to and from cargo areas and other facilities located on airport property. Also, because many airports are major employment centers, proper access for people employed on airport property must be provided. This issue is of particular importance at BFI, with the areas designation as a Manufacturing Industrial Center (MIC), supporting an estimated more than 21,000 direct and indirect aerospace and manufacturing jobs in 2013 from data presented in the Airport's most recent Economic Impact Study. The existing system of ground transportation access supporting BFI is described in the following paragraphs and presented in the following illustration, entitled *EXISTING AIRPORT LANDSIDE ACCESS*.

**Highways.** BFI is accessed by a network of state and federal highways. Interstate Highway 5 (I-5) extends along the full length of the eastern airport boundary, with access to the airport being provided from the South Boeing Access Road interchange that intersects both Airport Way South and East Marginal Way South approximately ½ mile south of the Airport. Also, an I-5 on ramp (providing both north and southbound access) is located approximately ¼ mile north of the Airport, which can be accessed from East Marginal Way South via South Michigan Street or Carson Avenue South.

On the west side of the Airport, access to State Highway 99/West Marginal Way is provided via East Marginal Way South, which intersects the highway approximately ¾ miles west from the north end of the Airport. A second connection between State Highway 99 and East Marginal Way South is provided via 16th Avenue South that crosses the Duwamish River at the South Park Bridge. East Marginal Way South also intersects State Highway 99/West Marginal Way again, about one mile south of the Airport, with State Highway 99 ultimately merging with I-5 about a 1 ½ miles further to the southeast.

**Arterial Streets.** The existing roadways surrounding BFI (e.g., Airport Way South, East Marginal Way South, Ellis Avenue South, and South Albro Place) are classified as Principal Arterials by the Seattle Comprehensive Plan/Transportation Appendix. As defined in the Comprehensive Plan, Principal Arterials are "to serve as the primary routes for moving traffic through the city, connecting urban centers and urban villages to one another, or to the regional transportation network". Both Airport Way South on the east side of the Airport and East Marginal Way South on the west side provide access to airport property along the full length of the Airport. According to 2014 vehicle volume/capacity data from the Transportation Appendix, both Airport Way South and East Marginal Way South are operating well below capacity (i.e., 38% and 34% respectively). Based on the 2035 projections, the vehicle volume/capacity are forecast to increase only slightly to 49% for East Marginal Way South. However, the 2035 projections for Airport Way South are forecast to exceed 100% of the roadway capacity, due in part to expected increases in vehicle volumes, but also based on current plans for potential bicycle improvements to the roadway that would reduce the throughput capacity for automobiles.

Because the City of Seattle and City of Tukwila jurisdictional boundary line intersect BFI property, a portion of the roadways located south of the Airport are contained within the City of Tukwila. A portion of Norfolk Road, located along the southern boundary of the Airport, is classified as a *Local Access Corridor* in the 2015 Figure A9

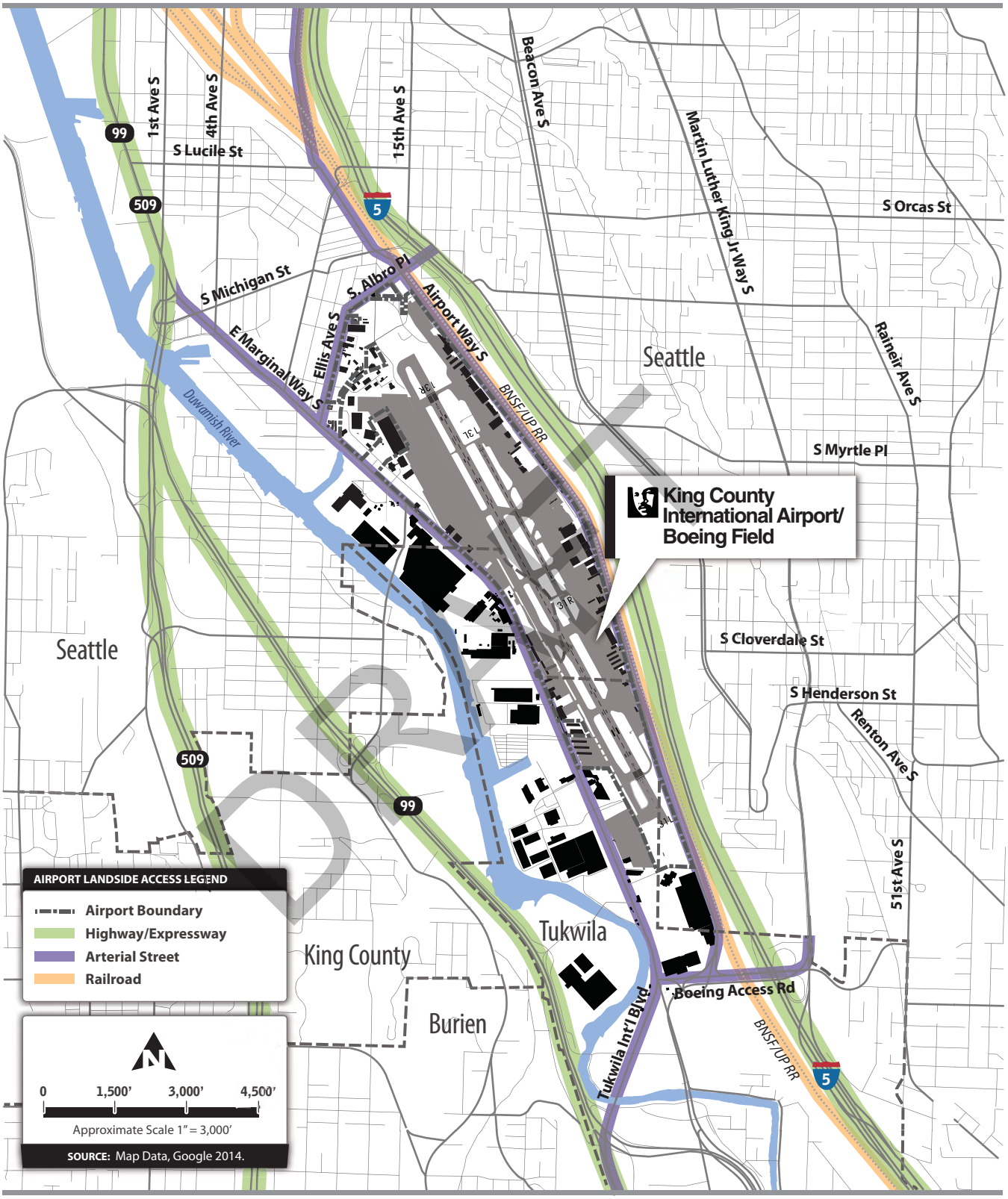


FIGURE A9 **Existing Airport Landside Access**

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Tukwila Comprehensive Plan, while South Boeing Access Road is classified as a Minor Corridor. Each of the roadways provide an east-west connection between Airport Way South and East Marginal Way South, as well as link I-5 to the east with Tukwila International Boulevard and State Highway 99 to the west. According to information presented in the *Transportation 2040 Appendix J: Regional Freight Strategy* prepared by Puget Sound Regional Council, Tukwila International Boulevard was also identified as "Arterial Constrained".

Given BFI's location in close proximity to two major highways and the areas designation as a Manufacturing Industrial Center, many of the roadways in the vicinity of the Airport, particularly East Marginal Way South, extending north from South Boeing Access Road and Airport Way South (due to the UPS air cargo operations) experience high truck volumes, and are designated as *Major Truck Streets* by the Seattle Department of Transportation.

**Railroads.** A major north-south railroad corridor is located just east of BFI, positioned between Airport Way South and I-5. The tracks are owned by the Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) Railroads, which transport international and domestic cargo to inland markets, as well as serve the Port of Seattle to the north and the Port of Tacoma to the south. BNSF operates a multi-modal storage/transfer yard located approximately two miles south of the Airport (on the extended runway centerline adjacent I-5), and both Amtrak and Sound Transit's Sounder Commuter Rail use the BNSF tracks. In addition, there are a number of industrial railroad spurs that are operated and controlled by the railroads and private property owners in the vicinity of BFI. The first is an abandoned spur that crosses Airport Way South, just south of the Airport, which previously served the large warehouse facilities located directly south of airport property. A second spur is located on the west side of the Airport, extending along the west side of East Marginal Way South, which serves the numerous industrial facilities (e.g., the various Boeing properties). This spur extends south from a large marshalling yard that is located approximately one mile north of the Airport (on the extended runway centerline). Currently, there is no existing railroad spur that provides direct rail access to airport property.

## Airspace System and NAVAIDS

BFI, as with all airports, functions within a local, regional, and national system of airports and airspace. The following illustration, entitled *AIRSPACE/NAVAIDS SUMMARY*, and narrative provide a brief description the Airport's role as an element within these systems.

### Air Traffic and Service Areas and Aviation Communications

FAA air traffic controllers, stationed in Air Route Traffic Control Centers (ARTCC), provide positive air traffic control within defined geographic jurisdictions. There are some twenty-two geographic ARTCC jurisdictions established within the continental United States. King County International Airport/Boeing Field is contained within the Seattle ARTCC jurisdiction, and includes the airspace in portions of Washington, Oregon, California, Nevada, Idaho, and Montana.

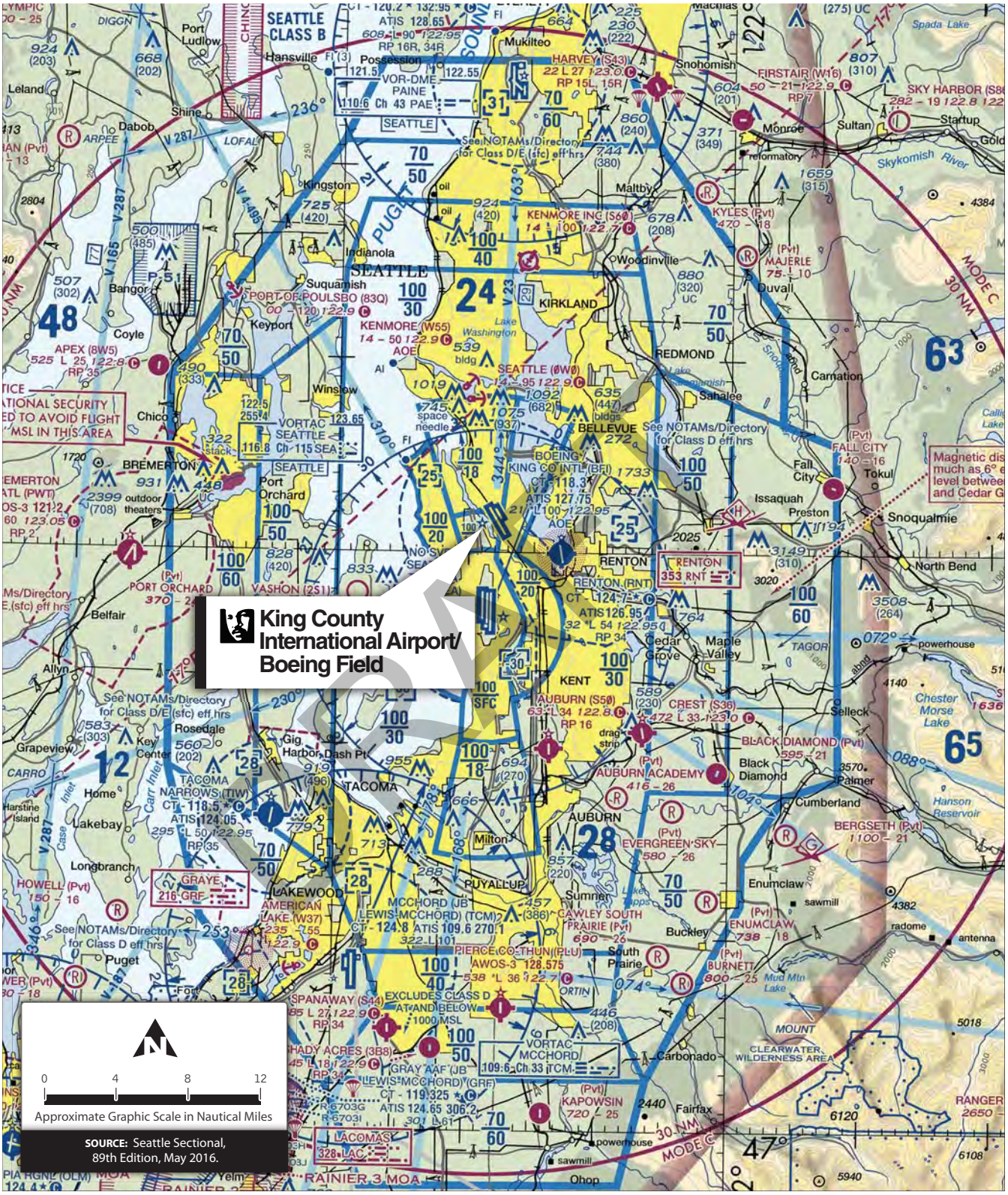


FIGURE A10 **Airspace/NAVAIDS Summary**

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**King County International Airport/ Boeing Field**

Aviation communication facilities associated with the Airport include the Air Traffic Control Tower on frequencies 118.3 (VFR from the east) and 120.6 (all IFR), Ground Control on frequency 121.9, Seattle Approach/ Departure Control on frequencies 119.2, 120.1, 120.4, 125.9, and 126.5 (depending on runway and direction), Automated Terminal Information System (ATIS) on frequency 127.75, Clearance Delivery on frequency 132.4, and Aeronautical Advisory Station (UNICOM) frequency on 122.95. In addition, the Airport has a separate frequency for the Boeing Company at 123.55.

## Airspace

King County International Airport/Boeing Field is a controlled airport with an airport traffic control tower (ATCT). Due to the Airport's close proximity with Sea-Tac International Airport (SEA), the local airspace surrounding BFI is contained within a portion of the SEA Class B airspace. The configuration of Class B airspace is tailored to each individual airport, and generally includes an area extending from the surface to 10,000 feet above mean sea level (AMSL) that includes two or more layers around the nation's busiest airports in terms of operations and enplanements. BFI is located within the borders of three airspace layers that range in surface elevation from 1,100, 1,800, 2,000 feet AMSL, and extend upward to 10,000 feet AMSL. All aircraft must receive Air Traffic Control (ATC) clearance to operate within this airspace and they are provided separation services by ATC.

Military airports, military operations areas, and restricted areas can also impact airspace use in the vicinity of a civil airport. There are two Military Operations Areas (MOAs) in the vicinity of the Airport (i.e., the Chinook A & B MOAs located 25 NMs northwest of the Airport and the Rainier 1, 2, & 3 MOAs located 28 NMs southwest of the Airport). However, the utilization of these MOAs does not negatively impact airspace or operations at BFI.

## Navigational Aids

A variety of navigational facilities are currently available to pilots in the vicinity of BFI, whether located at the field or at other locations in the region. Many of these navigational aids are available to en-route air traffic, as well. These include VORTAC facilities, VOR-DME facilities, and Non-Directional radio Beacon (NDB) facilities. A VORTAC (VHF Omnidirectional Range/Tactical Air Navigation) is a navigational aid providing VOR azimuth, TACAN Azimuth, and TACAN distance measuring equipment (DME) at a single site. A VOR-DME system is a Very High Frequency Omnidirectional Range Station with Distance Measuring Equipment transmitting very high frequency signals, 360 degrees in azimuth oriented from magnetic north. This equipment is used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigation aid. NDBs are general purpose low- or medium-frequency radio beacons that an aircraft equipped with a loop antenna can home in on or determine its bearing relative to the sending facility.

The Seattle VORTAC (116.8 SEA) is located roughly five NMs south of the Airport, the Paine VOR-DME (110.6 PAE) is located roughly twenty-two NMs north of the Airport, the Renton NDB (353 RNT) is located roughly four NMs southeast of the Airport, the Dondo NDB (224 ODD) is located approximately eleven NMs to the south of the Airport, and the Kitsap NDB (206 PWT) is located approximately nineteen NMs to the west of the Airport.

There are also a network of low-altitude published airways (Victor airways) in the vicinity of BFI also traverses the area, which spans between the regional ground based VOR/DME and VORTAC equipment. Victor airways include the airspace within parallel lines located four NMs on either side of the airway and extend from 1,200 feet AMSL up to, but not including, 18,000 feet AMSL. When an aircraft is flying on a federal airway below 18,000 feet average mean sea level (AMSL), the aircraft may be operating within Class B, C, or E airspace. BFI also has several existing visual navigational aids that are available to pilots. These include a rotating beacon, which is co-located with the ATCT, and lighted wind cones. Each of the existing runway ends is also equipped with PAPIs, which provide descent guidance for the visual segment of the approach. The PAPIs at Runways 13R, 13L, & 31R PAPI are configured for a 3.0-degree glide path angle, while the Runway 31R PAPI is configured for a 3.1 degree glide path angle.

In addition, this complement of navigational aids (NAVAIDS) permit a variety of instrument approaches at the Airport. Presently, there are five (5) instrument approach procedures published for BFI. These procedures are listed in the following table, entitled *INSTRUMENT APPROACH PROCEDURES.*

Table A7 **INSTRUMENT APPROACH PROCEDURES**

| Approach | Designated Runway(s) | Ceiling Minimums (AGL) | Visibility Minimums | Aircraft Category |
|---|---|---|---|---|
| **Runway 13R/31L** | | | | |
| ILS | Runway 13R | 273' AGL | 1-mile | A, B, C, D |
| ILS or LOC | Runway 31L | 407' AGL | 1 ½-miles | A, B, C, D |
| RNAV (RNP) Z (0.15 DA) * | Runway 13R | 505' AGL | 1 ½-miles | A, B, C, D |
| RNAV (RNP) Z (0.30 DA) * | Runway 13R | 619' AGL | 2-miles | A, B, C, D |
| RNAV (GPS) Y | Runway 13R | 703' AGL | ¾/1 ¾-miles | A, B/C, D |
| LOC/DME | Runway 13R | 542' AGL | 1/1 ½/1 ¾-miles | A, B/C/D |

***Source:*** *U.S. Terminal Procedures, Northwest (NW), Vol. 1, 28 April 2016 – 26 May 2016.*
** Authorization Required.*
***Notes:*** *Circling approaches not included.*

The BFI ATCT also maintains counts on the number of instrument operations that are conducted at the Airport. An instrument operation is recorded by the tower for each arriving or departing aircraft the flies a specified flight plan, regardless of the existing meteorological conditions. For calendar year 2015, 75% of the Airport's total operations were recorded as instrument operations.

## Fly Quiet Program

BFI management is committed to the promotion of aircraft operating procedures that minimize noise impact on airport neighbors. This philosophy is implemented through voluntary compliance and pilot participation in its Fly Quiet Awareness and Incentives programs, which are critical to achieving successful noise management at BFI. In efforts to achieve universal compliance, BFI operates a comprehensive noise

monitoring and flight tracking database information system that includes strategically located noise monitors to measure and report decibel levels of flights. A listing of the various Fly Quiet procedures are presented in the following text and illustrated in the following figure, entitled *FLY QUIET FLIGHT PROCEDURES.*

**Fly Quiet Flight Procedures.**

- Remain clear of Seattle Class Bravo airspace and at the highest possible altitude over noise-sensitive residential areas.
- When flying IFR procedures, use alternative approaches over Elliott Bay if authorized by approach control: RNAV GPS to RWY13R, RNAV RNP to RWY13R, or Harbor Visual.
- Use FAA-advised close-in departure for north flow flights. (Reference standard close-in flight procedure by aircraft type in FAA A/C 91-53A.)
- Honor voluntary restriction of nighttime engine maintenance run-ups and other activity between the hours of 10 p.m. and 7 a.m.

**Preferred VFR Fly Quiet Flight Procedures**

- Remain clear of Seattle Class Bravo at highest practical altitude on the approach until intercepting the PAPI (2 light) or glideslope unless directed otherwise by ATC.
- Runway 13L arrivals and departures should not cross the Runway 13R centerline, and should remain well east of it.
- During run-up, reduce power as quickly as possible after mag check and prop cycling.
- Climb after take-off at best-angle-of-climb speed until crossing the airport boundary to contain noise over runway; then climb at best rate. Make no turns until reaching end of runway, unless instructed otherwise.
- Reduce power and RPM when altitude is reached and remain high as practical over residential areas.
- Pilots are requested to operate their aircraft at the most reduced power settings in the traffic pattern.
- "Touch-and-Go" landings are not allowed between 10 p.m. and 7 a.m. (K.C.C. Title 15.16.150).
- Helicopter procedures:
    - Outbound from BFI, proceed via the northbound lanes of I-5 to the golf courses past the Martin Luther King Jr. Way interchange and then on course.
    - Inbound to BFI from the SE, proceed from Longacres to the gravel pit, then via the southbound lanes of Martin Luther King, Jr. Way.

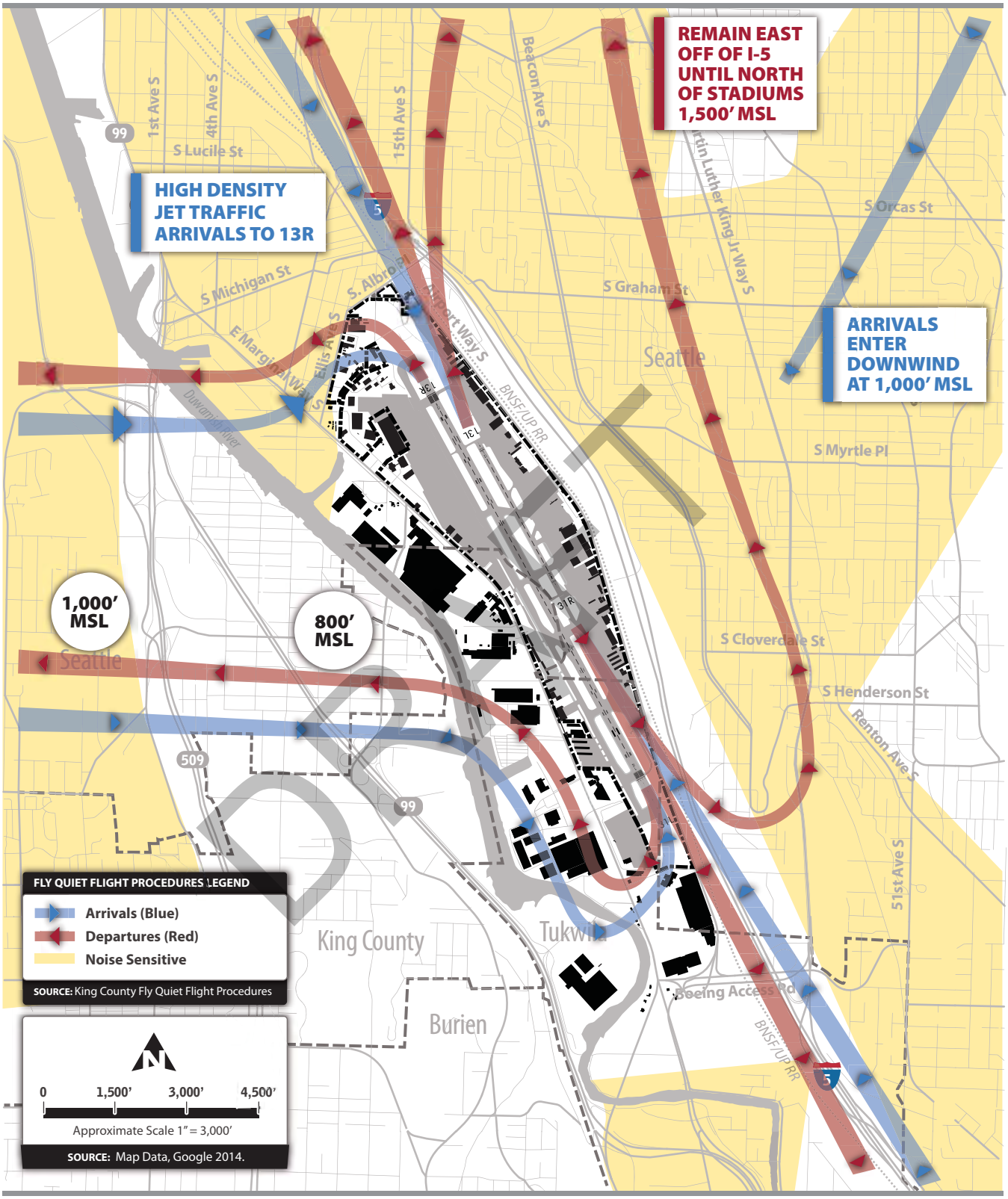


FIGURE A11 **Fly Quiet Flight Procedures**

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**King County International Airport/ Boeing Field**

## NextGen Airspace Optimization Study

In 2015, the Puget Sound Regional Council (PSRC), in conjunction with the FAA, completed a study (i.e., NextGen Airspace Optimization Study) to identify potential NextGen implementation options/strategies for the nine (9) general aviation airports located within the Puget Sound Region that are impacted by operations at SEA. The Study airports included:

- BFI
- Snohomish County Airport/Paine Field (PAE)
- Renton Municipal Airport (RTN)
- Crest Airpark (Kent) (S36)
- Pierce County Airport/Thun Field (PLU)
- Tacoma Narrows Airport (TIW)
- Auburn Municipal Airport (S50)
- Bremerton National Airport (PWT)
- Harvey Field (S43)

The Study identified a number of existing airspace and instrument approach procedure constraints for the general aviation airports, which include specific issues and opportunities for enhancement at BFI.

The issue constraints for BFI include:

- Close proximity with SEA and RTN (less than 5 nautical miles of separation exists between the three airports)
- Poor weather access (BFI has relatively high existing Instrument Approach Procedure minima)
- Shared use of Standard Terminal Arrival Routes (STARs) with both SEA and RTN
- Shared use of departure airspace with SEA
- Terrain/obstruction constraints

The enhancement opportunities for BFI include:

- Implement RNAV Standard Instrument Departures (SIDs) for both north Flow and South Flow conditions at BFI, SEA and RTN to permit independent operations at the three airports.
- De-conflict airspace between BFI and SEA with development of new NextGen RNAV (GPS) approach for poor weather/north flow conditions (during Plan C) to permit simultaneous/independent operations.
- Mitigation of existing obstructions and completion of new AGIS obstruction survey will be required to accommodate potential implementation of new NextGen instrument approach procedures.

It should be noted that a new AGIS obstruction survey will be prepared as an element of this MP Update and an update of existing obstructions will be documented in the Airport Layout Plan Drawing Set. In addition an obstruction removal/mitigation plan will prepared for BFI and an evaluation of this new obstruction data will be conducted by FAA Flight Procedures to determine if options exist to improve instrument approach procedure minima at BFI.

## Land Use and Zoning Inventory

**Existing Zoning.** Zoning is the public regulation of the use of land. It involves the adoption of ordinances that divide a community into various districts or zones. Each district allows a certain use of land within that zone, such as residential, commercial, and industrial (and others). Typical zoning regulations address things such as the height of a building, number of people that can occupy a building, lot area, setbacks, parking, signage, and density. Given the Airport's location within the Seattle Metropolitan Area, the existing airport boundary is contained within both the City of Seattle and City of Tukwila jurisdictional boundaries, as well as adjacent to the boundaries of King County to the southwest and the Cities of Burien and Seatac to the south. The location/proximity of these corporate boundaries to BFI are presented in the following figure, entitled, CORPORATE BOUNDARIES IN VICINITY OF BFI. However, in accordance with the Revised Code of Washington (RCW) 14.08.330, the "jurisdiction of municipality" (i.e., King County) has exclusive jurisdiction over the Airport and concurrent jurisdiction over adjacent territory. The specific language of RCW 14.08.330 is presented below for reference:

- RCW14.08.330. "Every airport and other air navigation facility controlled and operated by any municipality, or jointly controlled and operated pursuant to the provision of this chapter, shall subject to federal and state laws, rules and regulations, be under the exclusive jurisdiction and control of the municipality or municipalities controlling and operating it. The municipality or municipalities shall have concurrent jurisdiction over the adjacent territory described in RCW 14.08.120(2). No other municipality in which the airport or air navigation facility is located shall have any police jurisdiction of the same or any authority to charge or exact any license fees or occupation taxes for the operations."

A review of the existing zoning designations in the vicinity of BFI reveal that Industrial is the dominant zone. Virtually the entire airport property is zoned Industrial, with the exception of an area of Commercial at north end of the Airport, located south of South Albro Place. In addition, the portion of airport property located within the City of Tukwila and an area south of BFI is designated as an Industrial Center.

Directly north of the Airport, north of South Albro Place, there is a small area of Commercial that is bounded on the west by an area of Residential, which includes Industrial Buffer zoning (located within the Georgetown neighborhood). Further north, a large area of property that is bounded on the east by I-5 and on the west by Marginal Way SW (located within the Georgetown and Industrial District neighborhoods) is also zoned for Industrial.

East of the Airport, there is a narrow strip of Industrial that incorporates the railroad and I-5 right-of-ways. However, further to the east (east of I-5), the majority of property is zoned for Residential (within the North, Mid, and South Beacon Hill neighborhoods), but also includes some Commercial zoning along the Martin Luther King Jr. Way South corridor and Commercial/Office zoning along Beacon Avenue South.

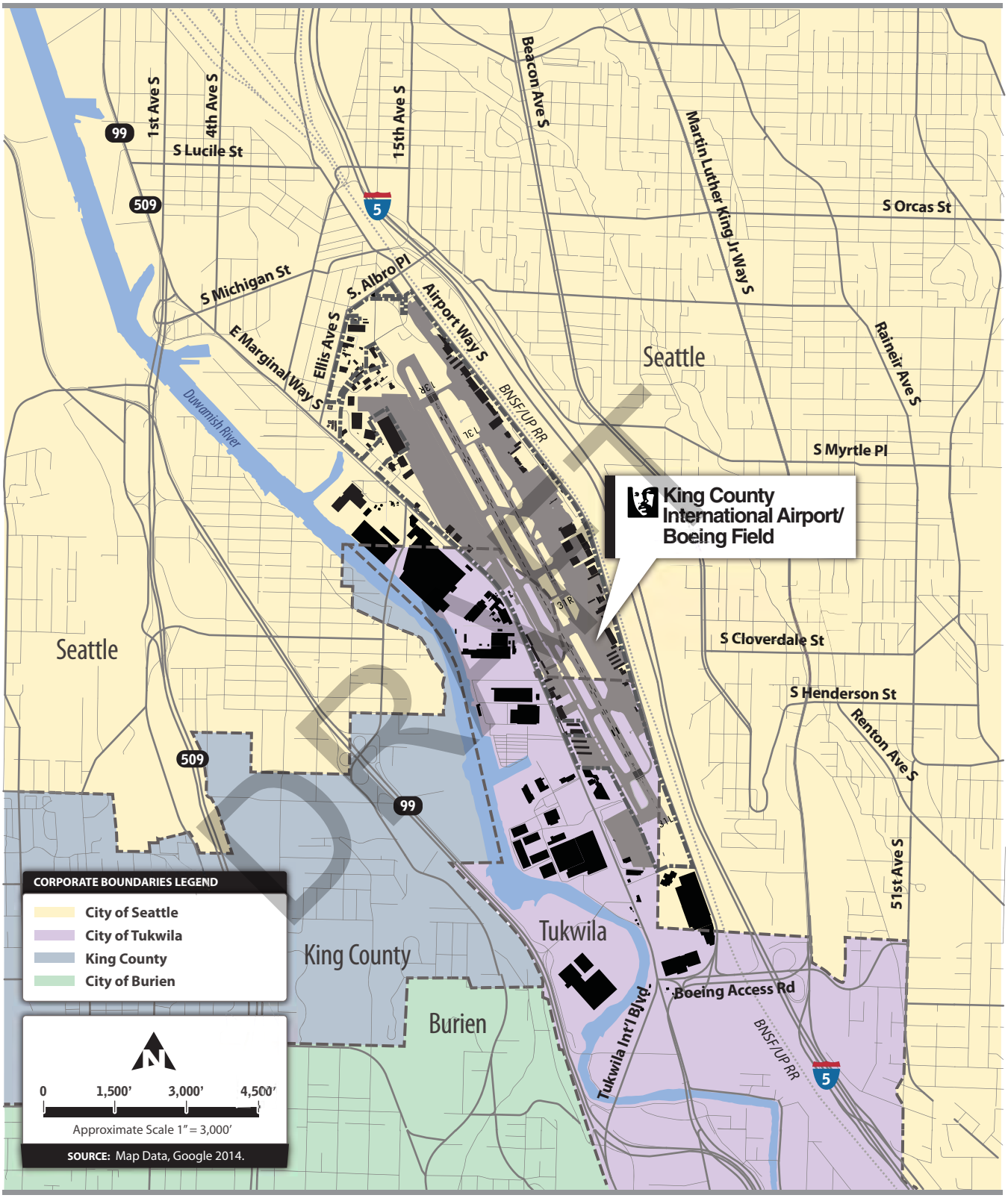


FIGURE A12 **Corporate Boundaries in Vicinity of BFI**

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**King County International Airport/ Boeing Field**

South of the Airport reflects a continuation of the Industrial zoning that is associated with the City of Tukwila's Industrial Center overlay, but also includes a large area of Industrial near the intersection of I-5 and S.H. Highway 599. In addition, there are large areas of residential that are located within the Cities of Tukwila, Burien, and Seatac that include strips of commercial along the major thoroughfares.

West of the Airport, Industrial zoning dominates along the west side of East Marginal Way and along the Duwamish River corridor. Further west, the area is primarily zoned for Residential within the Delridge, South Park, and Glendale neighborhoods, but also includes areas of Commercial and Commercial/Office zoning. Figure A13, entitled *GENERALIZED EXISTING ZONING*, provides a graphic summary of the land use zoning patterns in the area surrounding BFI.

The City of Seattle has also established airport overlay zoning regulations (i.e., see Chapter 23.54 - *Airport Height Overlay District*) that limit the height of objects within the vicinity of the Airport (applies to both Airport property and property adjacent to the Airport) to promote safe and unobstructed takeoff and landing approach paths. The Airport Height Overlay District is represented by five (5) overlay areas that are related in part on the imaginary surfaces developed by the Federal Aviation Administration to establish height limits surrounding airports. These overlay zones, which are presented on Figure A14, include:

- Inner Approach Area (IA)
- Outer Approach Area (OA)
- Turning Area (TG)
- Conical Area (CA)
- Transition Areas (TN)

The Development Standards of the Airport Height Overlay District are defined as follows:

- No structure shall be erected, or altered, in any area defined in this section to a height in excess of the limits established in this chapter unless otherwise provided.
- The maximum height permitted for structures and trees in each area shall be as follows, and shall be known as the height limits of the Airport Height Overlay District:
    - In Inner Approach Areas (IA), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the Inner Approach Surface. This shall not restrict heights in Inner Approach Areas to less than thirty-seven feet (37').
    - In Outer Approach Areas (OA), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the Outer Approach Surface.
    - In Turning Areas (TN), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the Turning Surface. This shall not restrict heights in Turning Areas to less than sixty-five feet (65').

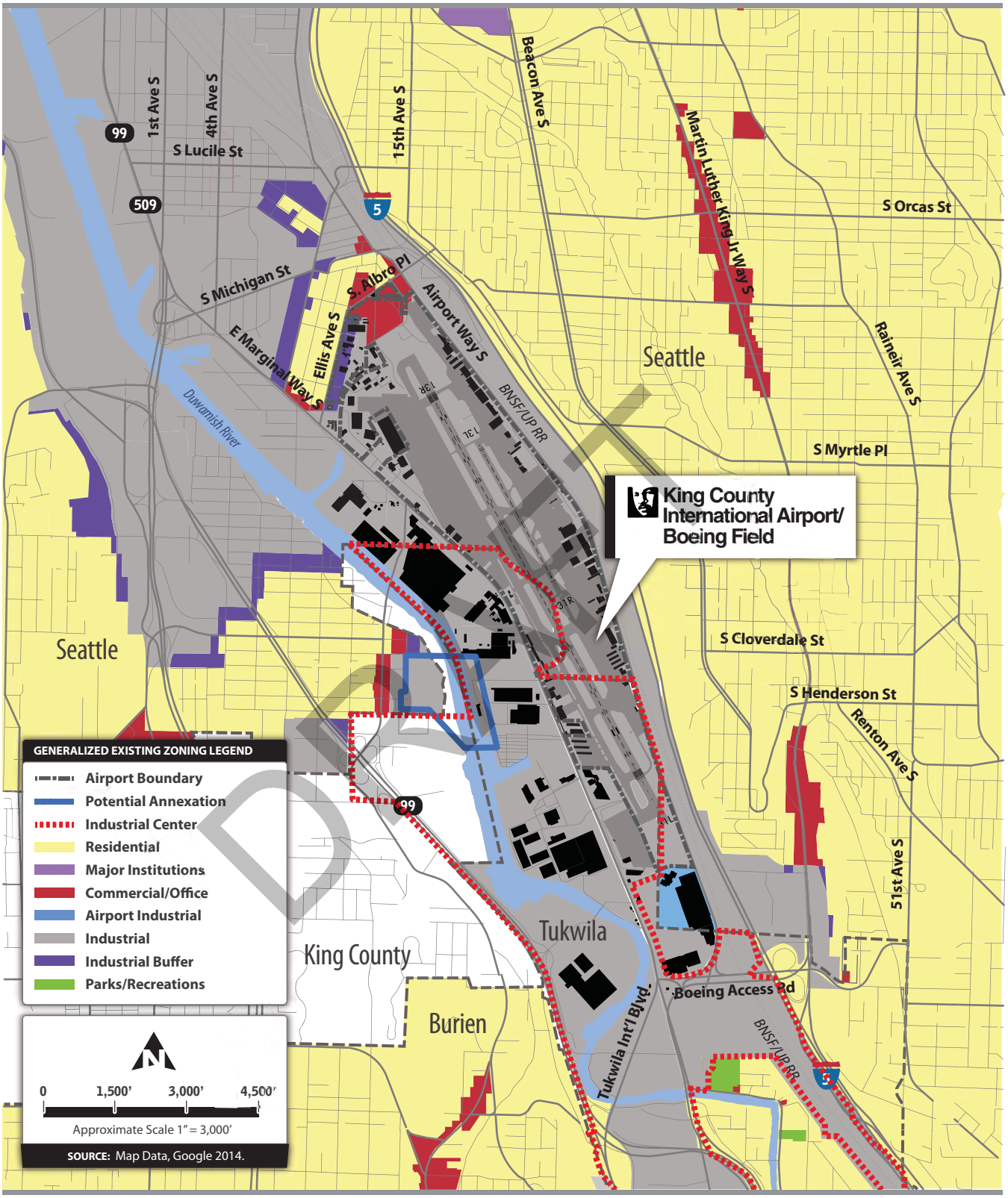


FIGURE A13 **Generalized Existing Zoning**

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**King County International Airport/ Boeing Field**

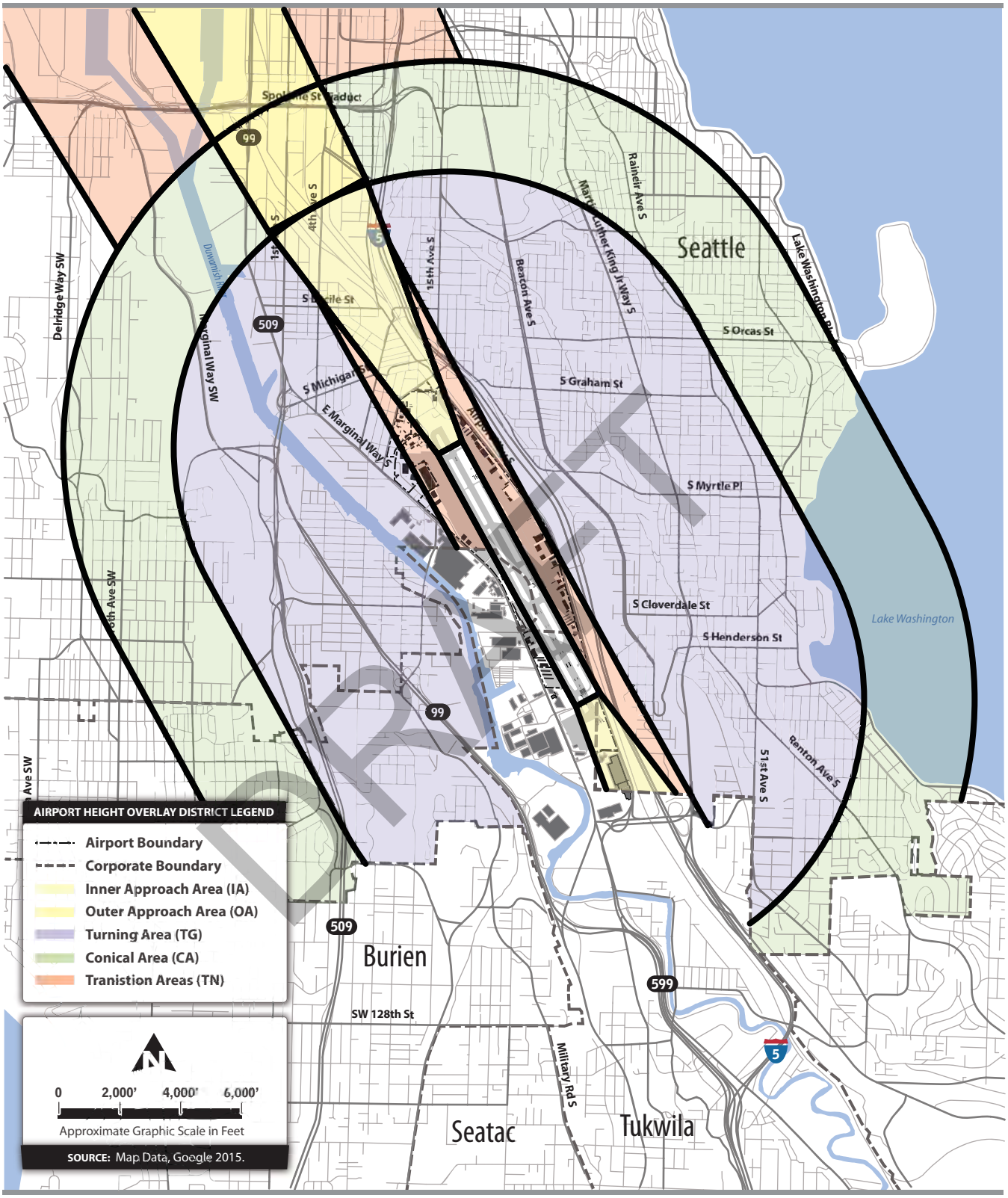


FIGURE A14 **Airport Height Overlay District**

Mead & Hunt

**King County International Airport/ Boeing Field**

- In Conical Areas (CA), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the Conical Surface. This shall not restrict heights in Conical Areas to less than sixty-five feet (65').
- In Transition Areas (TN), the boundaries of which are shown on the Official Airport Height Map, structures and trees shall not exceed the height of the inclined Transition Surfaces. This shall not restrict heights in Transition Areas to less than thirty-seven feet (37').

- Trees exceeding the height limits of the Airport Height Overlay District shall not be required to be cut or trimmed to conform to the height limits of the Airport Height Overlay District unless the Director is notified by the Federal Aviation Administration (FAA) that the trees are a potential hazard to aviation.

All properties located within the Airport Height Overlay District shall be subject to both the requirements of the underlying zone classification and to the requirements imposed for the Airport Height Overlay District. At no time shall the provisions of this chapter be read to modify the provisions of the underlying zoning, other overlay districts or special districts, except for height restrictions stated in this chapter. In any case where the provisions of the Airport Height Overlay District conflict with the provisions of the underlying zone, the more restrictive height limit shall apply. In addition, the Director may permit a structure to exceed the limits of the Airport Height Overlay District as a special exception pursuant to Chapter 23.76, Procedures for Master Use Permits and Council Land Use Decisions. Such an exception shall only be permitted if the Director finds that all of the following conditions exist:

- The Federal Aviation Administration advises the Director that the exception to the height limits does not create a hazard to aviation; and
- The additional height is necessary for the successful physical function of the structure; and
- The exception will not result in re-routing of aircraft; and
- The structure is designed to minimize adverse impacts of lighting on surrounding uses while complying with the lighting requirements of the Federal Aviation Administration.

### Existing Land Use

The existing lands uses in the general vicinity of the Airport, which primarily follow the existing zoning patterns, are defined by the current use of the property. The vast majority of existing lands north, south, and immediately surrounding the Airport are associated with Industrial land uses. There is a small area of Residential and Commercial land use directly north of airport property, including a larger area of Residential land use along the extended runway centerline, approximately one mile south of airport property.

Residential land uses dominate the properties located east I-5, with a mixture of some Commercial, Public, Parks/Open Space, and Mixed Use land uses. The existing land uses located west of the Airport include Industrial uses along the Duwamish River corridor, but also includes large areas of Residential, Park/Recreation land use associated with existing golf courses and park land located west of S.H. 99, and Commercial/Office land uses along the Arterial roadways.

Due to the metropolitan location, there are numerous schools in the vicinity of the Airport, ranging from elementary, middle schools, and high schools, but also including post-secondary schools. Within the study area boundary of the land use base map, there are approximately six schools located north of the Airport, fifteen to the east, three to the south, and nine to the west of BFI. Many churches are also located in the vicinity of BFI, interspersed primarily throughout the residential developed areas. The following illustration, entitled *GENERALIZED EXISTING LAND USE*, provides a graphic depiction of the existing land uses in the vicinity of BFI.

It should be noted that there are several municipal solid waste facilities located within five miles of the Airport. However, each are operated as enclosed storage/transfer facilities that would not serve as wildlife attractants. Waste Management operates from facilities located approximately one mile west and less than two miles north of the Airport, while Republic Services operates from facilities located less than two miles north of the Airport and approximately three miles south of the Airport. In addition, a composting facility (i.e., Cedar Grove Composting) is located along East Marginal Way, near the north end of the Airport, but this facility too is operated in an enclosed structure to mitigate potential wildlife attractants.

### Future Land Use

The future land use for the area surrounding BFI is depicted in Figure A16, entitled *GENERALIZED FUTURE LAND USE*. The primary source of the information is from the 2035 Future Land Use Plan contained in the current Draft City of Seattle Comprehensive Plan and Future Land Use Plan from the 2015 City of Tukwila Comprehensive Plan. The plan presents a vision for the City "where growth benefits and increases opportunities for all residents while offering ways to enhance and preserve our natural environment". This vision is guided by four (4) core values that will guide the goals and policies of the Comprehensive Plan. These include:

- Race and Social Equity
- Environmental Stewardship
- Economic Opportunity and Security
- Community

As with the existing zoning and land use maps, the vast majority of the property surrounding the Airport will continue to be identified for Industrial land uses (i.e., Manufacturing/Industrial Centers) and retain the existing north-south industrial corridor that is generally defined between I-5 and the Duwamish River. The area to the east of I-5 will continue to be dominated by Residential uses, but also include the expansion of several Residential and Hub Village areas, including Commercial uses along the north-south arterial roadways. The area to the east of the Duwamish River will continue to be represented by a combination of Residential and Parks/Open Space, with the expansion of an existing Residential Village southwest of BFI and Hub Village/Commercial land uses along the north-south arterial roadway corridors.

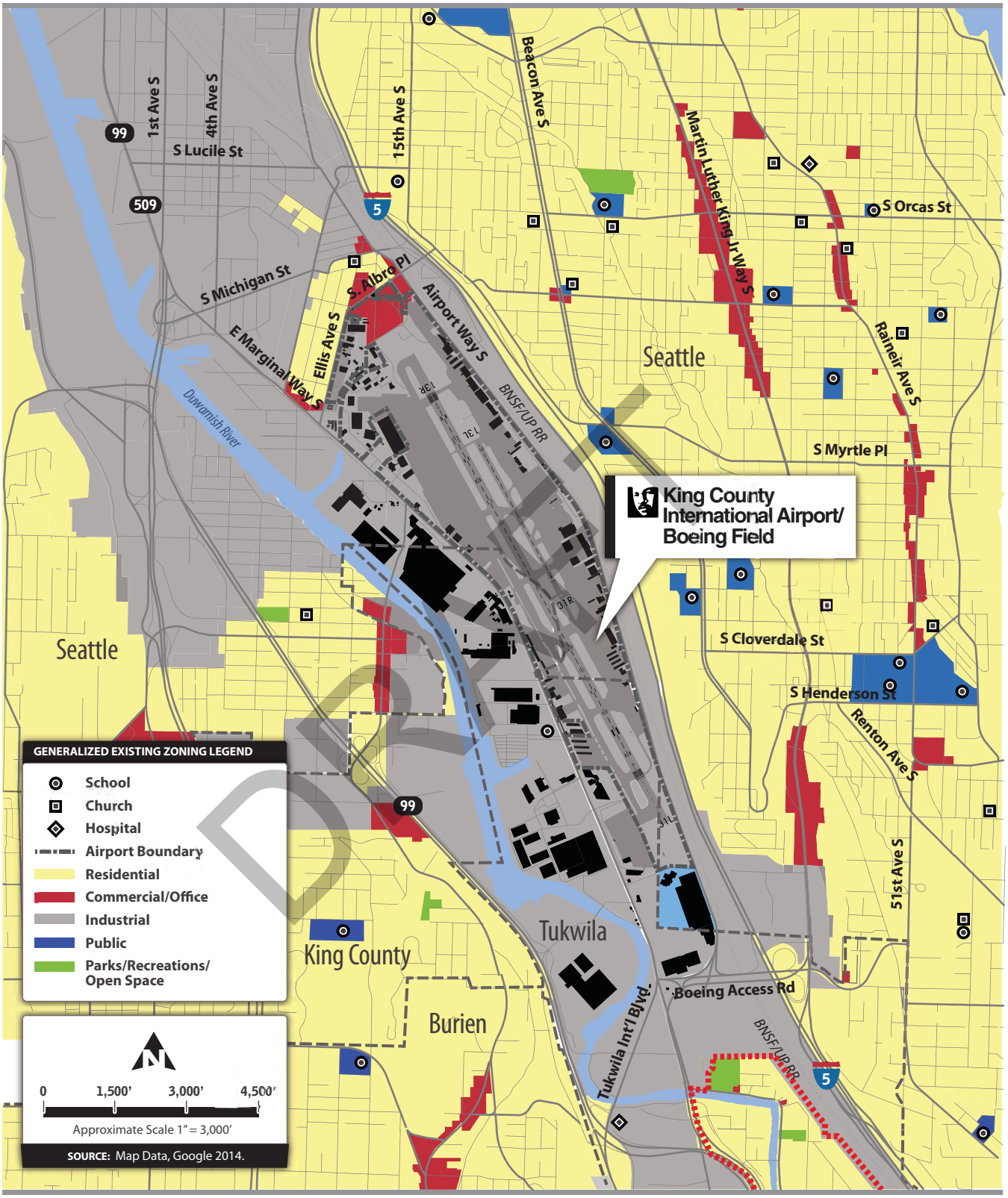


FIGURE A15 **Generalized Existing Land Use**

Mead &Hunt

**King County International Airport/ Boeing Field**

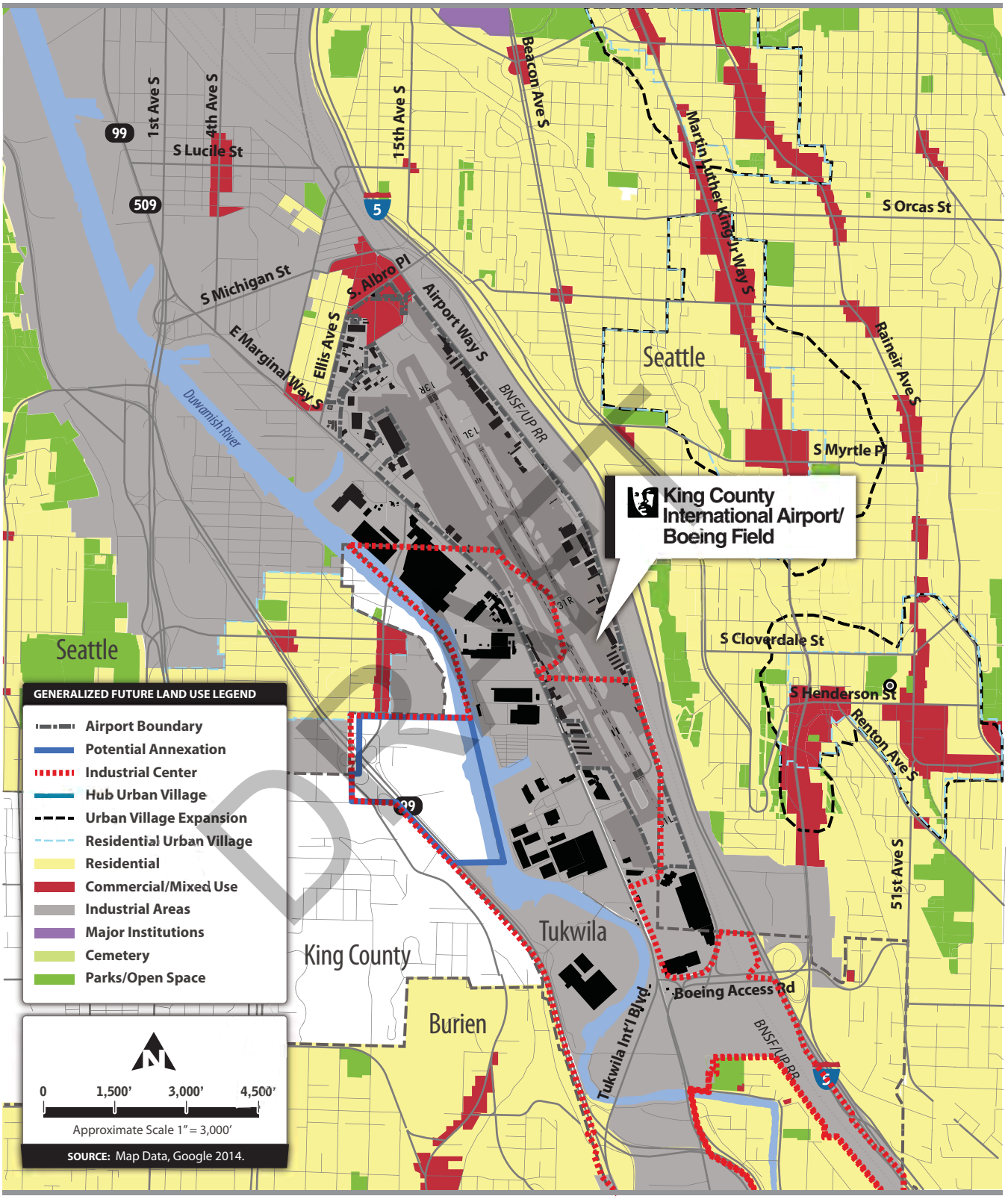


FIGURE A16 **Generalized Future Land Use**

Mead & Hunt

**King County International Airport/ Boeing Field**

## Environmental Review

Environmental considerations and factors are important to review during the airport planning process when analyzing development alternatives and identifying preferred alternatives. It is necessary to provide the airport sponsor with the information needed to expedite environmental processing that may be required in support of future airport development projects. The following sections provide a brief descriptions of environmental impact categories that are pertinent to airport planning, as well as airport-specific environmental information.

### Earth

King County International Airport/Boeing Field (BFI) property consists of approximately 600 acres, of which approximately 435 acres (about 73%) are covered by impervious surfaces; the remaining acreage is covered by grass and landscaping. The topography of BFI is generally flat, with the operational area (e.g., runways and taxiways) averaging a 1 to 2% slope; other surface slopes at BFI range from 0 to 5%. Previous studies describe the area soils as 5 to 10 feet of fill material, a 10-foot-thick (or less) layer of sandy silt/silty sand, and a layer of fine to medium fluvial sand extending to 40 feet below ground surface (BFI 2000, 2014).

### Air Quality

The federal government, and the state of Washington, have established health-based Ambient Air Quality Standards (AAQS) for six "criteria" air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SOx), particulate matter (course particles $PM_{10}$ and fine particles $PM_{2.5}$), and lead. Regions receive "attainment," "nonattainment," and "maintenance" designations by the U.S. Environmental Protection Agency (USEPA) based on the status relative to the National AAQS (NAAQS). Attainment refers to geographic areas that meet the NAAQS, while nonattainment refers to areas that do not meet the NAAQS. Maintenance areas refer to geographic areas that were once nonattainment but have recently achieved compliance with NAAQS. The following table lists the NAAQS and the State standards.

Table A8 **AMBIENT AIR QUALITY STANDARDS**

| Pollutant | National | | State of Washington |
|---|---|---|---|
| | Primary | Secondary | |
| **Carbon Monoxide** | | | |
| 8 Hour Average | 9 ppm | N/A | 9 ppm |
| 1 Hour Average | 35 ppm | N/A | 35 ppm |
| **Particulate Matter ($PM_{10}$)** | | | |
| Annual Arithmetic Mean | NA | NA | 50 $\mu g/m^3$ |
| 24 Hour Average | 150 $\mu g/m^3$ | 150 $\mu g/m^3$ | 150 $\mu g/m^3$ |
| **Particulate Matter ($PM_{2.5}$)** | | | |
| Annual Arithmetic Mean | 15 $\mu g/m^3$ | 15 $\mu g/m^3$ | NA |
| 24 Hour Average | 35 $\mu g/m^3$ | 35 $\mu g/m^3$ | NA |
| **Ozone** | | | |
| 8 Hour Average | 0.075 ppm | 0.075 ppm | NA |
| 1 Hour Average | NA | NA | 0.12 ppm |
| **Sulfur Dioxide** | | | |
| Annual Arithmetic Mean | 0.03 ppm | N/A | 0.02 ppm |
| 24 Hour Average | 0.14 ppm | N/A | 0.10 ppm |
| 3 Hour Average | N/A | 0.5 ppm | N/A |
| 1 Hour Average | N/A | N/A | 0.40 ppm |
| 1 Hour Average | N/A | N/A | 0.25 ppm |
| 1 Hour Average | 75 ppb | N/A | N/A |
| 5 Minute | N/A | N/A | 0.80 ppm |
| **Lead** | | | |
| Calendar Quarter Average | 1.5 $\mu g/m^3$ | 1.5 $\mu g/m^3$ | N/A |
| Rolling 3-Month Average | 0.15 $\mu g/m^3$ | N/A | N/A |
| **Nitrogen Dioxide** | | | |
| Annual Average | 0.053 ppm | 0.053 ppm | 0.05 ppm |
| 1-Hour Average | 0.110ppm | NA | NA |

***Notes:***
*ppm = parts per million*
*ppb = parts per billion*
*$\mu g/m^3$ = micrograms per cubic meter*
*N/A - Not Applicable*
*The averaging times for each pollutant may vary relative to determining an exceedance of the standards. For example, the 8-hour ozone standard is a 3-year average of the annual 4th highest daily 8-hr maximum concentration. The 1-hour SO2 standard at 75 ppb is a 3- year average annual arithmetic mean to a 3-year average of the 98th percentile of daily maximum 1-hour. The carbon monoxide standard is not to be exceeded more than once in a calendar year.*

BFI is located within a portion of the Central Puget Sound which is in attainment for all criteria pollutants, but because of past exceedances of the carbon monoxide standard and the course particle standard, is designated as maintenance and subject to a State Implementation Plan (SIP). The area was previously designated attainment/maintenance for ozone under the 1-hour ozone standard; however, the 1-hour standard was revoked by USEPA effective June 15, 2005 and attains the current 8-hour ozone standard. Several sub-areas within the Central Puget Sound Area are classified as maintenance for the PM10 standards,

including Kent, Duwamish (including King County International Airport), and Tacoma tide flats. The Central Puget Sound region is an attainment region for all other criteria pollutants.

There are four (4) air quality measurement station in the regional air monitoring network that are closest to King County International Airport: 1) Seattle-Duwamish, 2) Seattle-South Park, 3) Seattle-Beacon Hill, and 4) Seattle-10th & Weller. The Seattle-Duwamish and Seattle-South Park sites measures PM2.5 (fine particles) while the Seattle-Beacon Hill site measures nitrogen dioxide, ozone, carbon monoxide, sulfur dioxide and fine particles. The Seattle-10th & Weller measures nitrogen dioxide, carbon monoxide, and fine particles. The Puget Sound Clean Air Agency 2013 Air Quality Data Report[7] indicates that measured concentrations at all sites have been below the NAAQS and State Ambient Air Quality Standards shown in Table A8.

## Climate

King County International Airport is located approximately 5 miles south of downtown Seattle. Because the prevailing winds are from the Pacific Ocean, the general meteorological conditions of the Puget Sound region are typical of a marine climate. The Cascade Range to the east serves as a partial barrier to the temperature extremes of the continental climate of eastern Washington. Average summer temperatures range from 54 to 73 °F, and average winter temperatures range from 36 to 41 °F. Average precipitation is 37.2 inches per year, with most of the precipitation occurring from October through April.

Research has shown that there is a direct correlation between fuel combustion and greenhouse gas emissions which have been shown to be altering the earth's climate. Therefore, sources that require fuel or power at an airport are the primary sources that would generate greenhouse gases. In terms of relative U.S. contribution, the U.S. General Accounting Office (GAO) reports that aviation accounts "for about 3% of total U.S. greenhouse gas emissions from human sources, according to EPA data" compared with other industrial sources, including the remainder of the transportation sector (20%) and power generation (41%).[8] The International Civil Aviation Organization (ICAO) estimates that greenhouse emissions from aircraft account for roughly 3 percent of all anthropogenic greenhouse gas emissions globally. Climate change due to greenhouse gas emissions is a global phenomenon, so the affected environment is the global climate.[9]

King County has been very proactive on climate change issues. As one of the first airports to prepare a comprehensive greenhouse gas inventory, the County identified emissions in 2007 from the following airport sources:

- Sources owned and controlled by the County - referred to as Scope 1 sources/emissions
    - Airport fleet vehicles
    - Stationary Sources

[7] Puget Sound Clean Air Agency 2013 Air Quality Data Summary, August 2014

[8] IPCC Report as referenced in U.S. General Accounting Office (GAO) Environment: Aviation's Effects on the Global Atmosphere Are Potentially Significant and Expected to Grow; GAO/RCED-00-57, February 2000, p. 14; GAO cites available EPA data from 1997.

[9] As explained by the U.S. Environmental Protection Agency, "greenhouse gases, once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the United States." Climate Change Division, Office of Atmospheric Programs, U.S. Environmental Protection Agency, Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act 2-3 (2009), available at http:// epa.gov /climatechange/endangerment.html.

- Sources indirectly controlled by the County – referred to as Scope 2 sources/emissions
    - Purchased electricity
- Sources not controlled by the County – referred to as Scope 3 sources
    - Aircraft emissions
    - Aircraft related ground support equipment
    - Other tenant activities such as purchased electricity, stationary sources, etc
    - Public vehicular access to the Airport

Table A9 shows the results of the 2007 greenhouse gas evaluation for King County International Airport. That evaluation included two formats for presenting emissions: reference to the Scope 1, 2, and 3 as used by various greenhouse gas accounting protocols, but also the format recommended by the Airport Cooperative Research Program (ACRP) Report 11 Guidebook on Preparing Airport Greenhouse Gas Inventories. The 2007 evaluation included a backcast estimate of what emissions were in 1990 as well as a forecast of what emissions might increase to by 2020[10].

Approximately 263,414 metric tons of $CO_{2e}$ were emitted by airport-related sources in 2007 (Scope 1, 2, and 3). In contrast, about 187,472 metric tons of $CO_{2e}$ were emitted in 1990, and 304,132 metrics tons are anticipated to occur in 2020 if no further reduction actions are undertaken (business as usual). Of total airport-related emissions, King County owned or controlled less than 1% of the emissions in 2007 (686 metric tons of $CO_{2e}$). Over 98% of the emissions associated with the Airport were generated with aircraft operations, which the County does not own or have the authority to control.

The largest portion of greenhouse gas emissions that the County either owns or has substantial control at the Airport in 2007 was due to natural gas consumption at airport facilities, while 38% of emissions were caused by gas/diesel fuel use in airport fleet vehicles. While the County does not own the ground vehicles from users accessing their aircraft in tie-down locations (on airfield), they do control that activity, which represents less than 1 metric ton.



[10] It is important to note that as of preparation of this inventory, aircraft operations in 2015 were about 50% of what they were in 2007 or the 2020 forecast used to forecast emissions. Thus, today, greenhouse gases would be expected to be lower than predicted back in 2007.

Table A9 **SUMMARY OF GREENHOUSE GAS EMISSIONS ASSOCIATED WITH BOEING FIELD ACTIVITY (2007, BACKCAST 1990 AND FORECAST 2020)**

| User/Source Category | WRI Scope | 2007 | | | | $CO_2$ Emissions | | |
|---|---|---|---|---|---|---|---|---|
| | | $CO_2$ (tons/ year) | Percent of User | % of Total | | 1990 Backcast | | 2020 Forecast |
| ***King County-owned/controlled*** | | | | | | | | |
| **Facilities/Stationary Sources** | | | | | | | | |
| Electrical | 2 | 44 | 6.4% | 0.0% | | 127 | | 53 |
| Other (oil, gas) | 1 | 381 | 55.6% | 0.1% | | 323 | | 487 |
| **Facilities Total** | ½ | 425 | 62.0% | 0.2% | | 449 | | 541 |
| **County Fleet Vehicles** (on- and off-road) | 1 | 260 | 38.0% | 0.1% | | 288 | | 267 |
| **Ground Access Vehicles** (on-airport travel) | 3 | 0.3 | 0.0% | 0.0% | | 0 | | 0 |
| **King County-owned/controlled Total** | | **686** | **100.0%** | **0.3%** | | **737** | | **809** |
| ***Airlines/Aircraft Op/Tenants-owned/controlled*** | | | | | | | | |
| **Aircraft** | | | | | | | | |
| Approach | 3 | 8,628 | 3.3% | 3.3% | | 6,694 | | 10,006 |
| Taxi/Idle/Delay | 3 | 21,837 | 8.3% | 8.3% | | 15,557 | | 25,102 |
| Takeoff | 3 | 10,343 | 3.9% | 3.9% | | 7,318 | | 12,077 |
| Climb Out | 3 | 5,945 | 2.3% | 2.3% | | 4,592 | | 6,733 |
| Subtotal LTO | 3 | 46,752 | 17.8% | 17.7% | | 34,161 | | 53,918 |
| Residual/Cruise/APU | 3 | 212,776 | 81.2% | 80.8% | | 149,333 | | 245,628 |
| **Aircraft Total** | 3 | **259,528** | **99.1%** | **98.5%** | | **183,494** | | **299,547** |
| ***Airlines/Aircraft Op/Tenants-owned/controlled*** | | | | | | | | |
| **Ground Support Equipment** | 3 | **2,001** | **0.8%** | **0.8%** | | **2,211** | | **2,055** |
| **Ground Access Vehicles** (on-airport and off-airport) | 3 | | | | | | | |
| Tenant Ground Access Vehicles | 3 | **308** | **0.1%** | 0.1% | | **340** | | **316** |
| Tenant Employee Commute | 3 | **82** | **0.0%** | 0.0% | | **91** | | **84** |
| **Ground Access Vehicles Total** | 3 | **390** | **0.1%** | **0.1%** | | **431** | | **401** |
| **Stationary Sources** | 3 | **-** | **0.0%** | **0.0%** | | - | | - |
| **Airline/Tenant-owned/controlled Total** | | **261,919** | **100.0%** | **99.4%** | | **186,136** | | **302,002** |
| ***Public-owned/controlled*** | | | | | | | | |
| Passengers (on and off airport) | 3 | 378 | 46.7% | 0.1% | | 122 | | 651 |
| County Employee Commute (on and off airport) | 3 | 327 | 0.1% | 0.1% | | 362 | | 563 |
| Tiedown users (off airport) | 3 | 104 | 12.8% | 0.0% | | 115 | | 106 |
| **Public-owned-controlled Total** | | **810** | **100.0%** | **0.3%** | | **599** | | **1,321** |
| **Total Metric Tons** | | **263,414** | | **100%** | | **187,472** | | **304,132** |
| **Operations** | | **300,184** | | | | **331,643** | | **308,242** |
| **Enplanements** | | **27,352** | | | | **8,837** | | **47,060** |

***SOURCE:*** *Synergy Consultants, January 2011. Activity: FAA Terminal Area Forecast November 2010.*

## Water Quality

**Surface Water.** BFI is located within the Green-Duwamish River watershed and the Duwamish Estuary sub-watershed. The closest surface water to BFI is the Duwamish River, which is approximately 1,200 feet to the west.

The Duwamish River is classified by the State of Washington as Class B (Good). Class B waters are not considered clean enough for domestic water supply, only for industrial and agricultural uses. The waters are considered safe for secondary contact, like fishing and boating, but not safe for direct contact, like swimming (Ecology 2016). The Duwamish River is listed as a 303(d) impaired water body for the following parameters: sediment bioassay, bezo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h,)anthracene, arsenic, indeno(1,2,3-cd)pyrene, 1,2-dichlorobenzen, 1,2-dichlorobenzen, 1,4-dichlorobenzen, 2,4-dichlorophenol, 2,4,6-trichlorophenol, anthracene, antimony, benx(a)anthracene, bis(2-chloroisopropyl)ether, bis(2-ethylhexyl)phthalate, dibutyl phthalate, diethyl phthalate, dimethyl phthalate, temperature, hexachlorobenzene, hexachlorobutadiene, hexachlorocyclopentadiene, hexachloroethane, isophorone, mercure, nickel, nitrobenzene, n-nitrosodiphenylamine, pentachlorophenol, phenol, pyrene, and thallium (Ecology 2012).

Stormwater generated at BFI is regulated primarily through the airport's Industrial Stormwater General Permit (ISGP) (WAR 000343) and has in place a Stormwater Pollution Prevention Plan, which was prepared for the airport in 2015 under the National Pollutant Discharge Elimination System (NDPES). Some tenant facilities within BFI also have ISGPs, which they comply with directly with the Washington State Department of Ecology (Ecology). The stormwater infrastructure at the site has been developed for compliance with these permit requirements. In addition, stormwater quality standards, infrastructure, and activities (e.g., source control activities) are influenced by environmental cleanups or orders that have been initiated at BFI or in downstream sediments.

In particular, source control activities performed as part of the Lower Duwamish Waterway Sediment Superfund Site may have an impact on the management of stormwater at BFI. King County's Source Control Implementation Plan 2014–2018 (King County 2016) has been developed with input from Ecology to summarize source control efforts for the basin that includes BFI. Source control implementation will continue at least until the commencement of sediment cleanup in the Lower Duwamish Waterway.

In addition, Boeing, King County, and the City of Seattle have entered into an Agreed Order with Ecology to perform a remedial investigation/feasibility study for potential contamination in soil, groundwater, stormwater solids, and downstream sediments for the North Boeing Field Georgetown Steam Plant site. The impact of the Agreed Order on stormwater management at BFI is not known at this time.

- Aircraft Fueling. Aircraft are fueled throughout BFI using fuel trucks that load fuel from a combination of above-ground and underground storage tanks. Based upon 2015 aviation fuel storage data provided by airport staff, there is 517,000 gallons of Jet A, 35,000 gallons of Avgas, and 12,000 gallons of unleaded gasoline storage capacity located on or in close proximity to airport property.

Aviation fuel loading into the storage tanks and from the tanks into the fuel trucks is done with a closed-hose transfer connection. Closed-hose connections are also used for fueling large aircraft, while smaller planes are fueled by a person with a hand-held nozzle. Fuel spills occur infrequently and are cleaned up with absorption material and vacuum pumps.

- Aircraft Maintenance. Aircraft and ground vehicles are stored and maintained by the majority of tenants at BFI. Most maintenance occurs in hangars; however, some aircraft are maintained while parked outside in a tie-down stall. Most of the hangars have floor drains, which feed to oil/water separators before discharging to the sanitary sewer system. Incidental spills of lubricating oils, hydraulic oils, degreasers, and other materials commonly used for aircraft maintenance are cleaned up with absorption materials (BFI 2004).

- Aircraft Washing. There are currently six designated wash pads for aircraft washing at BFI. Designated wash areas contain a wash rack and an oil/water separator to collect the runoff, which is then routed to the sanitary sewer system (BFI 2004).

- De-icing Chemicals. De-icing is performed on aircraft to minimize the ice build-up on the wings and body during cold weather. De-icing at BFI is relatively infrequent because of the moderate weather in Western Washington. All of the pads used for washing and de-icing discharge to the sanitary sewer system. The primary aircraft de-icing material is ethylene glycol (BFI 2004).

**Groundwater.** There are two group D groundwater wells found on BFI property. There is no water quality data available for these wells. King County's Groundwater Interactive Maps show that BFI is not in a critical aquafer recharge area, groundwater management area, wellhead protection area, sole source aquifer or an area susceptible to groundwater contamination (King County 2016a).

## Noise

Noise is generally defined as unwanted sound and, as such, the determination of acceptable levels is subjective. The basic unit in the computation of day-night sound level (DNL) is the Sound Exposure Level (SEL). An SEL is computed by adding the decibels adjusted dB(A) level for each second of a noise event above a certain threshold. For example, a noise monitor located in a quiet residential area [40 dB(A)] receives the sound impulses of an approaching aircraft and records the highest dB(A) reading for each second of the event as the aircraft approaches and departs the site. Each of these one-second readings is then added logarithmically to compute the SEL.

The computation of DNL involves the adding, weighting, and averaging of each SEL to achieve the DNL level in a particular location. The SEL of any single noise event occurring between the hours of 10:00 p.m. and 7:00 a.m. is automatically weighted by adding 10 dB(A) to the SEL to account for the assumed additional irritation perceived during that time period. All SELs are then averaged over a given time period (day, week, year) to achieve a level characteristic of the total noise environment. DNL levels usually are depicted as grid cells or contours. Grid cells are squares of land of a specific size that are entirely characterized by a noise level. Contours are interpolations of noise levels based on the centroid of a grid cell and drawn to connect all points

of similar level. Contours appear similar to topographical contours and form concentric "footprints" about a noise source. These footprints of DNL contours drawn about an airport are used to predict community response to the noise from aircraft using that airport.

It should also be noted that a Federal Aviation Regulation (FAR) Part 150 Study was completed/adopted for BFI in 2005 that generated a 2008 Noise Exposure Map, which included several Noise Compatibility Program recommendations that were documented in the FAA's Record of Approval. King County has implemented several of the recommendations over the past several years [e.g., update of the Flight Tracking and Noise Monitoring Program (i.e., the Fly Quiet Program), completion of the Sound Attenuation Program, purchase of avigation easements, and sales transaction assistance in the 65 and 70 DNL noise contours].

In addition, an updated set of 2014 baseline DNL noise contours were prepared for BFI in conjunction with the BFI Tanker Flight Test Noise Study that was completed in 2015. These 2014 noise contours are presented for reference in the following figure, entitled *BFI 2014 DNL NOISE CONTOURS,* and the 65 DNL contour for 2014 is smaller than what was generated for the 2008 noise contours in the FAR Part 150 Study. However, a new set of existing and future noise contours will be developed for this MP Update, following Sponsor and FAA review/approval of the aviation activity forecasts that utilize the most current aircraft operational data. These new contours will be presented in the Development Concepts & Alternatives Analysis chapter of this Study.

## Plants and Animals/Biotic Communities and Endangered Species

BFI is a highly developed site, with a large amount of pavement and impervious surface. Vegetation around the runways consists mainly of mowed grass that is managed carefully to discourage wildlife use. The closest potential habitat for Endangered Species Act (ESA)-listed species is within the Duwamish Waterway, about 1,200 feet from the BFI boundary (see Figure A19).

ESA, as amended, requires any federal agency to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction of adverse modification to habitat of such species.

A summary of ESA-listed threatened and endangered species potentially occurring within the vicinity of BFI under the jurisdiction of the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) (NMFS 2015; USFWS 2015a) is identified in Table A10. The table also identifies whether critical habitat has been designated by NMFS or USFWS for those species within the vicinity of BFI.

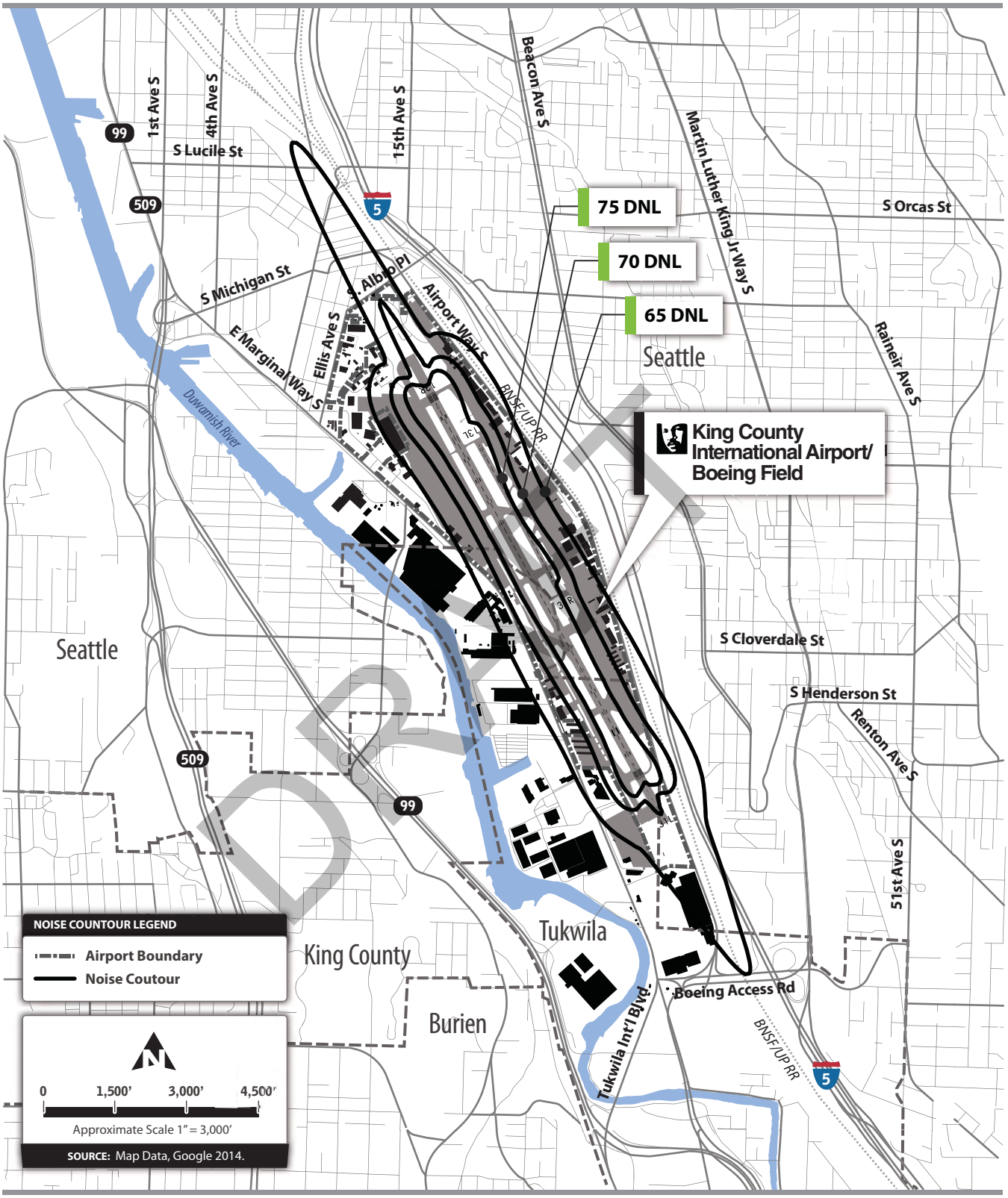


FIGURE A17 **King County International Airport 2014 DNL Noise Contours**

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**King County International Airport/ Boeing Field**

Table A10 **SPECIES AND CRITICAL HABITAT WITH FEDERAL ESA STATUS THAT MAY OCCUR IN THE VICINITY OF BFI**

| Common Name (*Scientific Name*) | Jurisdiction | ESA Status | Critical Habitat |
|---|---|---|---|
| Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound ESU | NMFS | Threatened | Designated; occurs in Duwamish Waterway |
| Steelhead (*Oncorhynchus mykiss*) Puget Sound DPS | NMFS | Threatened | Designated; occurs in Duwamish Waterway |
| Bull trout (*Salvelinus confluentus*) Coastal-Puget Sound DPS | USFWS | Threatened | Designated; occurs in Duwamish Waterway |

***Notes:***
*ESU = Evolutionarily Significant Unit*
*DPS = Distinct Population Segment*
*NMFS = National Marine Fisheries Service*
*USFWS = U.S. Fish and Wildlife Service*

Marine fish species and marine mammals under NMFS jurisdiction that occur in Puget Sound are not identified because the Duwamish Waterway does not provide suitable habitat for marine species. USFWS identifies the additional species of Canada lynx (Lynx canadensis), marbled murrelet (Brachyramphus marmoratus), yellow-billed cuckoo (Coccyzus americanus), and streaked horned lark (Eremophila alpestris strigata) as potentially occurring in the vicinity of BFI (USFWS 2016a). Suitable habitat for these species is not present within the boundaries or the vicinity of BFI.

Listed plant species identified by USFWS to be potentially present in the vicinity of BFI included the golden paintbrush (Castilleja levisecta; USFWS 2016a). Suitable habitat for this plant species is not present within the boundaries of or adjacent to BFI.

Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) maps and Salmonscape websites identified the Duwamish Waterway as habitat for coho, fall chum, sockeye, pink salmon, Chinook salmon, steelhead, and bull trout (WDFW 2016a, 2016b).

The Magnuson-Stevens Act mandates that federal agencies consult with the Secretary of Commerce on all activities or proposed activities, authorized, funded, or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." In addition to species listed as threatened or endangered, EFH consultations are required for non-listed, federally managed fishery species, which include Puget Sound coho and pink salmon populations. As previously stated, WDFW PHS and Salmonscape websites identified the Duwamish Waterway as habitat for coho and pink salmon (WDFW 2016a, 2016b).

The Migratory Bird Treaty Act makes it illegal to pursue, hunt, take, capture, kill, attempt to take, capture, or kill any migratory bird or "any part, nest, or egg of any such bird ... by any means or in any manner," except as allowed by permit. Migratory birds that occur in King County include all birds except house sparrows, starlings, feral pigeons (rock doves), pheasant, quail, and domestic ducks, geese, and other exotic birds. Migratory birds could potentially occur in suitable habitat within or in the vicinity of BFI.

## Energy and Natural Resources

BFI uses energy in the form of electricity, natural gas, aviation fuel, diesel fuel, and gasoline for the operation of the facilities, aircraft, and associated support equipment. The following text summarizes the providers and use of these energy sources.

- Aircraft and Surface Vehicle Fuel. Four types of fuel are used at BFI to power aircraft and ground vehicles: Jet A, avgas, fuel, unleaded gasoline, and diesel. In 2015, airport uses consumed about 13 million gallons of these types of fuel. The primary suppliers of fuels are Texaco, AvFuel, and Valley Oil (BFI 2004).

- Electrical Power. Puget Sound Energy and Seattle City Light provide electrical power to BFI and airport facilities. In 1999, the combined metered use of electricity at BFI was approximately 877,000 kilowatt hours (BFI 2004).

## Land Use Compatibility

BFI lies within the cities of Seattle and Tukwila. Land use in the BFI area is primarily industrial and commercial, consisting of two manufacturing/industrial centers (Duwamish and Tukwila) that were established to ensure that adequate accessible industrial land is available to promote a diversified employment base. There are also small residential areas within the area: to the north and west of BFI is the Georgetown neighborhood in Seattle, to the south is the Allentown neighborhood in Tukwila, and the eastern boundary of the area overlaps a portion of the Holly Park neighborhood in Seattle. General existing land uses are shown in Figure A15. Noise related to the airport and surrounding area was presented in a previous section.

BFI and the surrounding area is zoned under the City of Seattle as IG2 U/85, General Industrial, with unlimited height for manufacturing and industrial uses, and with an 85-foot height limit for other uses (City of Seattle DCI 2016). Because BFI is owned, operated, and maintained by the County, the planning and land use activities are controlled through the King County Code. Airport development is guided through the King County International Airport Master Plan and the Federal Aviation Administration approved Airport Layout Plan (King County 2012).

## Social and Induced Socio-economic Impacts

The neighborhoods surrounding the BFI have a small residential component. The 2013 Regional Centers Monitoring Report prepared for the City of Seattle's Manufacturing and Industrial Centers estimates that approximately 85% of the land area is in industrial use, with the remaining 15% in commercial, institutional, residential, and undeveloped lands. As a collective group, the average population in the study area exceeds the threshold for minority populations, but is within the threshold for low-income populations as defined by the U.S. Census Bureau (2010).

The economic impact of BFI in 2013 was $3.5 billion in local business sales, supporting 16,336 jobs and $1.08 billion in labor income, as measured by a version of the Washington State input-output model, benchmarked against King County. In addition, $78 million in sales, business, and occupation taxes were generated in the state of Washington and in the local area. There were 5,209 people employed at the Airport in 2013, earning

$495 million in labor income. Direct sales by businesses at the Airport were $2.2 billion in 2013, of which $1.8 billion was accounted for by aerospace activity. Most business activity at KCIA is exported from this region, contributing significantly to the economic base of the region. The majority of this business activity—referred to as "new money"-- would not be present in King County without BFI. New money or export sales were $1.9 billion in 2013, or 90% of total business activity at BFI. This export related business generated $3 billion in sales by King County businesses, generated 13,205 jobs and $872 million in labor income in King County.

## Public Services and Utilities

Electricity, water, wastewater, natural gas, telephone service, and emergency services are available at BFI. Table A11 lists the utility and service providers.

Table A11 **UTILITY PROVIDERS AT BFI**

| Utility/Services | Provider |
|---|---|
| Electricity | Seattle City Light |
| Water | Seattle Public Utilities/City of Tukwila |
| Wastewater | City of Tukwila/King County (Metro) |
| Natural Gas | Puget Sound Energy |
| Telephone | CenturyLink |
| Internet | Comcast |
| Fire and Police | Air Rescue and Fire Fighting/King County Airport Police |

***Note:*** *Aviation fuel is brought to BFI via truck by a variety of vendors.*

## DOT 4(f) Lands and Recreational Uses

Section 4(f) of the U.S. Department of Transportation Act, states that no publicly owned park, recreation area, wildlife or waterfowl refuge, or land of historic site that is of national, state or local significance shall be used, acquired, or affected by programs or projects requiring federal assistance for implementation unless there is no feasible or prudent alternative.

There are 17 public parks, and various recreational and historic sites identified within the vicinity of BFI. Table A12 lists the various sites and the direction from the center of BFI, and these are presented in the following figure, entitled *PARKS, RECREATION, & HISTORIC SITES*.

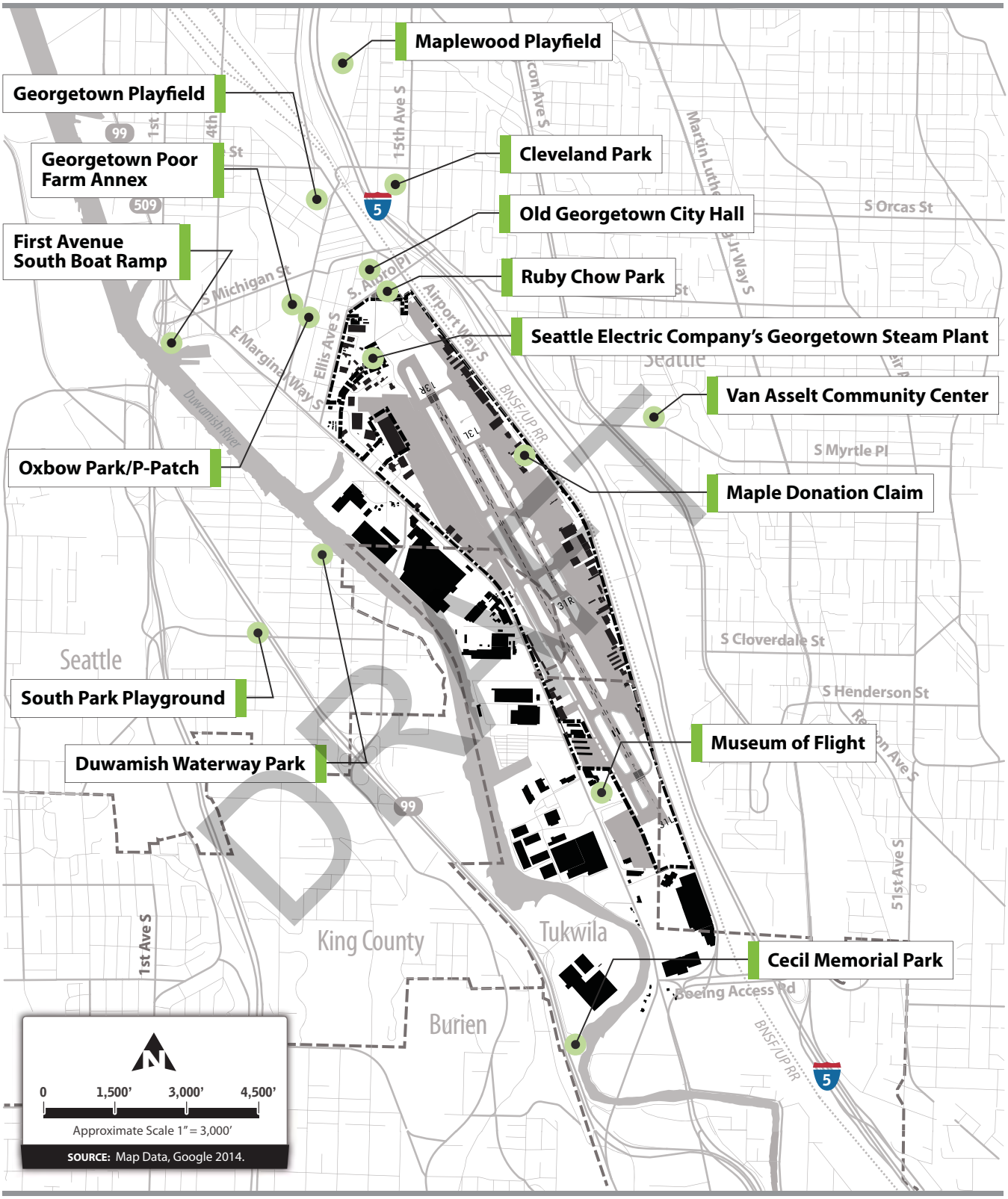


FIGURE A18 **Parks, Recreation, and Historic Sites**

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**King County International Airport/ Boeing Field**

Table A12 **PARKS, RECREATION AREAS, AND HISTORIC SITES WITHIN THE VICINITY OF BFI**

| Site | Direction |
|---|---|
| Oxbow Park/P-Patch | North |
| Cecil Memorial Park | Southwest |
| Duwamish Hill Preserve | South |
| South Park Playground | West |
| Foster Golf Links | South |
| Van Asselt Community Center | East |
| Cleveland Park | East |
| Georgetown Playfield | North |
| Maplewood Playfield | North |
| Ruby Chow Park | North |
| First Avenue South Boat Ramp | Northwest |
| Duwamish Waterway Park | West |
| Museum of Flight | Southwest |
| Seattle Electric Company's Georgetown Steam Plant | North |
| Old Georgetown City Hall | North |
| Georgetown Poor Farm Annex | North |
| Maple Donation Claim | North |

***SOURCE:*** *Google Maps; BFI 2004.*

## Historic, Cultural, and Archaeological Resources

**Existing Conditions.** BFI is located adjacent to the Duwamish Waterway in Seattle's historic Georgetown neighborhood. BFI contains a number of historic and potentially historic properties.

- Built Environment. Two structures located at the Airport, but on parcels that are not within the boundaries of BFI, are listed on both the National Register of Historic Places (NRHP) and Washington Heritage Register (WHR; Figure A18):
  - Seattle Electric Company's Georgetown Steam Plant (also a City of Seattle Landmark)
  - Boeing Airplane Company's Building No. 105

A plaque commemorating the Maple family's Donation Land Claim Act property, which became Boeing Field, is also located within the boundaries of BFI and is listed on the WHR (but not the NRHP). The cremated remains of John and Samuel Maple are interred at this location (WISAARD 2016).

Several structures within the boundaries of BFI have been determined NRHP-eligible (Table A13; Figure A18) but are not currently listed (BOLA 2012):

Table A13 **NRHP-ELIGIBLE HISTORIC STRUCTURES (NOT LISTED)**

| HRI No.[1] | Name | Alternate Name | Address |
|---|---|---|---|
| 1720 | Terminal Building | Administration Building | 7277 Perimeter Rd. S. |
| 3032 | The Airport Office Building[2] | Civil Aeronautics Authority Office and Warehouse | 7300 Perimeter Rd. S. |
| 3029 | Hangar 3 | -- | 7827 Perimeter Rd. S. |
| 3033 | Air Traffic Control Tower | -- | 8200 E. Marginal Way S. |
| 3031 | Small Airplane Hangars | -- | 8465–8490 Perimeter Rd. S. |
| 3030 | North Annex Building[2] | Former King County Administration Building | 7233 Perimeter Rd. S. |

***Notes:***
*[1] Historic Resources Inventory*
*[2] Programmed for removal.*

A number of other properties have been recorded within BFI boundaries, but not evaluated for listing on local, state, or national historic registers (WISAARD 2016; BOLA 2012):

- Building 201 of the Washington Air National Guard Station
- Boeing Company's Building 3-323 (it has been recommended not eligible for listing in the NRHP, but no formal determination has been made)
- Boeing Company Administrative Offices
- The Norfolk Regulator, part of Seattle's wastewater treatment system built in 1969

In addition to properties within the boundaries of the BFI, there are a number of listed and determined eligible properties adjacent to the airport. These include Old Georgetown City Hall, the 14th Avenue South Bridge, and a number of homes.

**Archaeology.** One archaeological site is recorded within the boundaries of the BFI. Site 45KI538 is a segment of the Columbia and Puget Sound Railroad. It has not been evaluated but is potentially NRHP-eligible. Several archaeological surveys have been conducted within BFI boundaries, but are limited in extent. These surveys have indicated that there is fill across much of the property, as deep as 16 feet or deeper in areas, but that there is remaining potential for pre-contact and historic archaeological materials under the fill.

## Solid Waste

Solid waste services are available at BFI and provided by City of Tukwila and King County Metro. King County contracts two private firms, Waste Management, Inc., and Rabanco, to provide receiving facilities for non-recyclable construction, demolition, and land clearing (COL) wastes generated in King County. Waste handling services provided by Waste Management and Rabanco include transfer of mixed loads of COL wastes, removal of recyclable materials, and collection and disposal of COL wastes. The COL waste collected at transfer facilities is disposed of in landfills permitted, owned, and operated by these companies.

to their final disposal. A COL Material Management Resource Guide, published by the King County Solid Waste Division, lists local COL recycling facilities (BFI 2004).

## Floodplains

Executive Order 11988 directs federal agencies to take action to reduce the risk of flood loss, minimize the impacts of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains.

According to Federal Emergency Management Agency (FEMA)-published floodplain maps, BFI is not within the FEMA-mapped 100-year floodplain of the Duwamish Waterway. BFI is also not within King County-mapped flood hazard areas (King County 2016b). The closest surface water to BFI is the Duwamish Waterway, located approximately 1,200 feet west of the BFI boundary (see Figure A19).

## Wetlands

Wetlands are defined as areas inundated by surface or groundwater, with a frequency sufficient to support vegetation or aquatic life requiring saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands and other Waters of the U.S. may be classified as "jurisdictional" or "non-jurisdictional." Jurisdictional wetlands and designated Waters of the U.S. are under the authority of and are regulated by the U.S. Army Corps of Engineers (USACE). USACE must be consulted whenever jurisdictional wetlands and other Waters of the U.S. are present. Wetlands within the boundaries of BFI would also be protected under the jurisdiction of the King County Code (King County 2016c).

According to the National Wetlands Inventory maps maintained by the USFWS, there are six palustrine emergent wetlands located on BFI property (USFWS 2016b)[11]. These wetlands are also identified on the WDFW PHS maps (WDFW 2016a). According to the USFWS and WDFW PHS maps, these wetlands are located within the mowed vegetated areas adjacent to the airport runways. The location of wetlands on BFI property are shown on Figure A19.

## Coastal Zone Management and Wild and Scenic Rivers

All coastal counties within the State of Washington are subject to the Coastal Zone Management Program. The Coastal Zone Management Program is based primarily upon the Shoreline Management Act, as well as other state land use and resource management laws. Local shoreline master programs are approved and adopted by the State, which ensures consistency with the Coastal Zone Management Act. The Washington State Department of Ecology determines the consistency of a proposed development with the Coastal Zone Management Act and the Washington Coastal Zone Management Program. Within the BFI vicinity, the Duwamish Waterway is the only water body under the jurisdiction of a local Shoreline Master Program.

The Wild and Scenic River Act was created to preserve selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes. The Duwamish River is not protected under the Wild and Scenic River Act.

[11] Current status of wetlands to be confirmed with BFI Staff.

## Farmland

**Existing Conditions.** The Farmland Protection and Policy Act was enacted to minimize the loss of prime farmland and unique farmland as a result of a federal action resulting in converting designated lands to nonagricultural use.

BFI is not identified as farmland and resides in a fully developed industrial area in Seattle and Tukwila (King County 2016d).

## Aesthetics, Views, Light Emissions

**Existing Conditions.** BFI is located in a heavily industrialized area. Because of the industrialized nature of the surrounding area, the visual character of the airport buildings and paved areas fits well with its surroundings. The airfield provides a large area of open space in a relatively densely developed area, which allows for breaks in the views from the water and land side of BFI.

Lighting systems at BFI supply the airfield (i.e., runway/taxiway edge lights, approach lighting systems, lighted visual landing aids, and rotating beacon), terminal buildings, access roadways, parking, and other on-airport buildings.

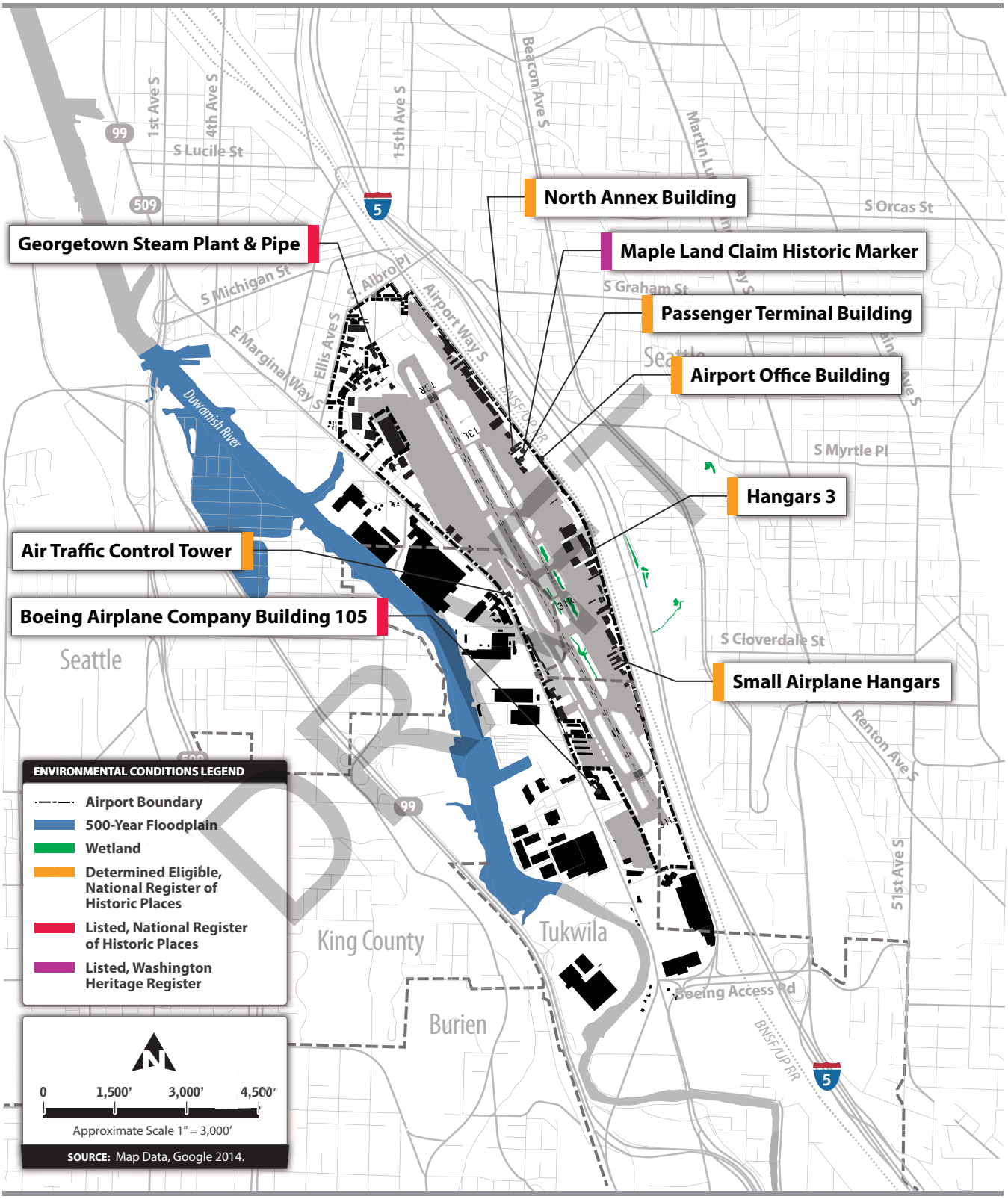


FIGURE A19 **Environmental Conditions**

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**King County International Airport/ Boeing Field**

## Airport Financial Inventory

The primary goal of a financial inventory is to gather information summarizing the financial management of the Airport. Additionally, it is important for developing an understanding of the financial structure, constraints, requirements, and opportunities for aviation and non-aviation activities, as related to the development of a capital improvement program. The information that has been gathered and reviewed will be used to formulate a reasonable and financially sound Capital Improvement Program (CIP) with which to fund projects identified in the master planning process.

With this goal in mind, revenue, expense, and management information for the Airport has been gathered for fiscal years 2010 through 2016. Federal and state capital improvement grant information has been compiled, including current funding policies and a historical review of previous grants. The Airport's current five-year CIP has also been received and reviewed. Specific documents gathered include:

- 2004 KCIA Master Plan Capital Completion List, Annotated
- KCIA FAA Capital Project Request Update, FFY 2014 thru FFY 2021
- Documentation on KCIA capital & unmet needs, 2015 – 2020
- KCIA Capital Investment Needs 2015 – 2026
- 2013-2014 King County International Airport Line of Business Plan
- KCIA 2005 – 2014 FTEs, Personnel & CIP Costs
- 2015 Biennial Budget Finance Model
- King County International Airport Economic Impact Study 2013
- King County International Airport Strategic Plan, 2014 – 2020
- KCIA Leasehold Matrix and Map, 2016
- King County Strategic Plan, 2010-2014

As noted above, one of the documents reviewed was the 2004 KCIA Master Plan Capital Completion List, Annotated. This is the complete listing of capital projects identified in the 2004 Airport Master Plan which has been annotated to recognize those project which have been completed and those that remain as "still needed" but incomplete and still in the planning stage. By far, the majority of the capital improvement projects identified the 2004 Master Plan have been completed or are on-going capital needs, such as pavement rehab and maintenance. This indicates that the timing of this MP Update is critical. In later sections the MP Update, a new 20-year capital project list is identified which includes a realistic financial plan to pay for these project capital needs, in consideration of existing and potential income streams and ongoing operation expenses.

The current CIP for the Airport which is on file with the FAA (FFY 2014 thru FFY 2021) includes these projects:

- Construct Airport Rescue and Fire Fighting (ARFF) Station
- Airport Master Plan Update
- Construct Snow Removal Equipment Building
- Woods Meadows Land Acquisition
- Runway Renumbering
- Airfield Electrical Improvements
- Acquire ARFF Truck

- Acquire Snow Broom
- Construction of Large Aircraft Parking Apron

Perhaps the most important document gathered is the King County Strategic Plan 2010-2014. Specifically the Economic Growth and Built Environment and the Financial Stewardship sections of the County's Strategic Plan will be used specifically to provide guidance in the preparation of the MP Update's financial plan and program. The goals and objective of these two section are listed below.

### Economic Growth and Build Environment

- **Goal**: Encourage a growing and diverse King County economy and vibrant, thriving and sustainable communities
    - Objective 1: Support a strong, diverse, and sustainable economy
    - Objective 2: Meet the growing need for transportation services and facilities throughout the county
    - Objective 3: Shape a built environment that allows communities to flourish
    - Objective 4: Preserve the unique character of our rural communities in collaboration with rural residents

### Financial Stewardship

- Goal: Exercise sound financial management and build King County's long-term fiscal strength
    - Objective 1: Keep the county's cost of doing business down, including keeping growth in costs below the rate of inflation
    - Objective 2: Plan for the long-term sustainability of county services
    - Objective 3: Provide the public with choices about which services King County delivers within existing resources and for which services they would like to provide additional funding

In summary, this financial inventory section has been prepared as a precursor to the preparation of the Financial Plan and Program developed later in the planning process. Specifically, this section it is intended to provide a listing of the financial background information which has been gathered and which will be utilized as a basis in the preparation of the MP Update's capital improvement program funding recommendations.

## Summary

The goal of this chapter is to provide general background information pertaining to BFI, its operating environment, and its physical surroundings. The *Inventory of Existing Conditions* chapter is vital from the standpoint that it will be used as a reference in the analysis and alternatives design process, which is required to prepare the Airport's future development plan.

The next step in the planning process is to formulate forecasts for the quantity and type of future aviation activity expected to occur at the Airport during the forthcoming twenty years.

# B Forecasts of Aviation Activity

**INTRODUCTION.** This chapter identifies the 20-year aviation activity forecasts for the King County International Airport/Boeing Field (the Airport or BFI). The MP Update forecasts provide an expectation of activity levels used to guide the analysis of future airport facility needs, alternatives, and development strategies.

The aviation demand projections are documented in the following sections:

- ***Forecast Methodology***
- ***Airport Service/Market Area Overview***
- ***Aviation Industry Trends***
- ***Forecast Resources***
- ***Regional Demographics***
- ***Airport Related Aviation Forecast and Community Trends***
- ***Forecast of Aviation Demand Activity***
  - Commercial Air Passengers & Operations
  - Air Cargo & Operations
  - General Aviation Operations
  - Aircraft Operations (Mix, Peaking, Critical Planning Aircraft)
  - General Aviation Based Aircraft
- ***FAA TAF Comparison and Forecast Conclusion***

## Forecast Methodology

Aviation forecasts are time-based projections offering a reasonable expectation of future Airport activity, in which the forecast of activity projections influences nearly every aspect of the MP Update process. The relationship between current activity and forecast demand is an indicator as to the type, timing, and allocation of future Airport infrastructure, equipment, and service needs.

**Forecast Timeline.** The forecasts are prepared annually for a 20-year planning period, from 2015 through 2035, identified in 5-year increments, and segmented into three planning phases: 1) 'near-term' (2015-2020), 2) 'mid-term' (2021-2025) and, 3) 'long-term' (2025-2035).

**Forecast Approach.** The forecasts are developed consistent with FAA forecasting guidance and published data, reflecting the current baseline of Airport activity levels, user trends, and industry-wide activity patterns. The forecasts attempt to account for various factors and influences, in which forecast projections reflect a varying range of reasonable scenarios to account for plausible activity and demand circumstances.

- *Unconstrained Forecasts.* Assumes the Airport is sufficiently able to develop facilities necessary to accommodate future activity, as demand arises. This typically represents the 'high' forecast scenario.

- *Constrained Forecasts.* Assumes the Airport is restrained by physical and/or operational limitations to accommodating future demand. This typically represents the 'low' to 'medium' forecast scenario.

The preferred based aircraft projection for the Airport is carried forward in the master planning process and is used to examine future airport facility needs. It should be understood there are typically year-to-year fluctuations to forecast activity due to various unanticipated factors and unforeseen demand circumstances. Although activity levels during individual years might vary above or below the forecast projections, the Airport's future developments should conform to the tracking of actual activity.

## Airport Service/Market Area Overview

**Airport Service Area and Roles.** The BFI aeronautical service area entails a composite of individual aviation market segments (passengers, cargo, general aviation, tenant commerce). These discrete service area markets each has a corresponding geographical catchment area extending throughout the Seattle Metropolitan Area, conjoining and overlapping with multiple commercial service and general aviation public-use airports in the surrounding vicinity (SEA, RNT, PAE, S50, PWT). As a factor involving surrounding airports, transportation corridors between commerce centers, and drive times, it is estimated the BFI aeronautical service area is primarily concentrated within King County, serving a population of nearly 2.1 million residents.

**Airport Based Aircraft Owner Locations.** The identification of based aircraft owner locations is one means to discern the geographical boundary and concentration characteristics of an airport's aeronautical service area. **Figure B1** depicts BFI registered aircraft owners plotted by zip code density. Of the 309 listed aircraft owner address, 72% reside within a 20-mile radius of BFI and east of Puget Sound, as largely amassed within the Seattle MSA, and mostly contained by the north and south King County boundary. The greatest owner concentrations are north and northeast, including north Seattle, Bellevue, Kirkland, Mercer Island, and Redmond. This service area analysis suggests, other than the Renton Municipal Airport (RNT), there is little based aircraft ownership overlap with the surrounding public use airport system.

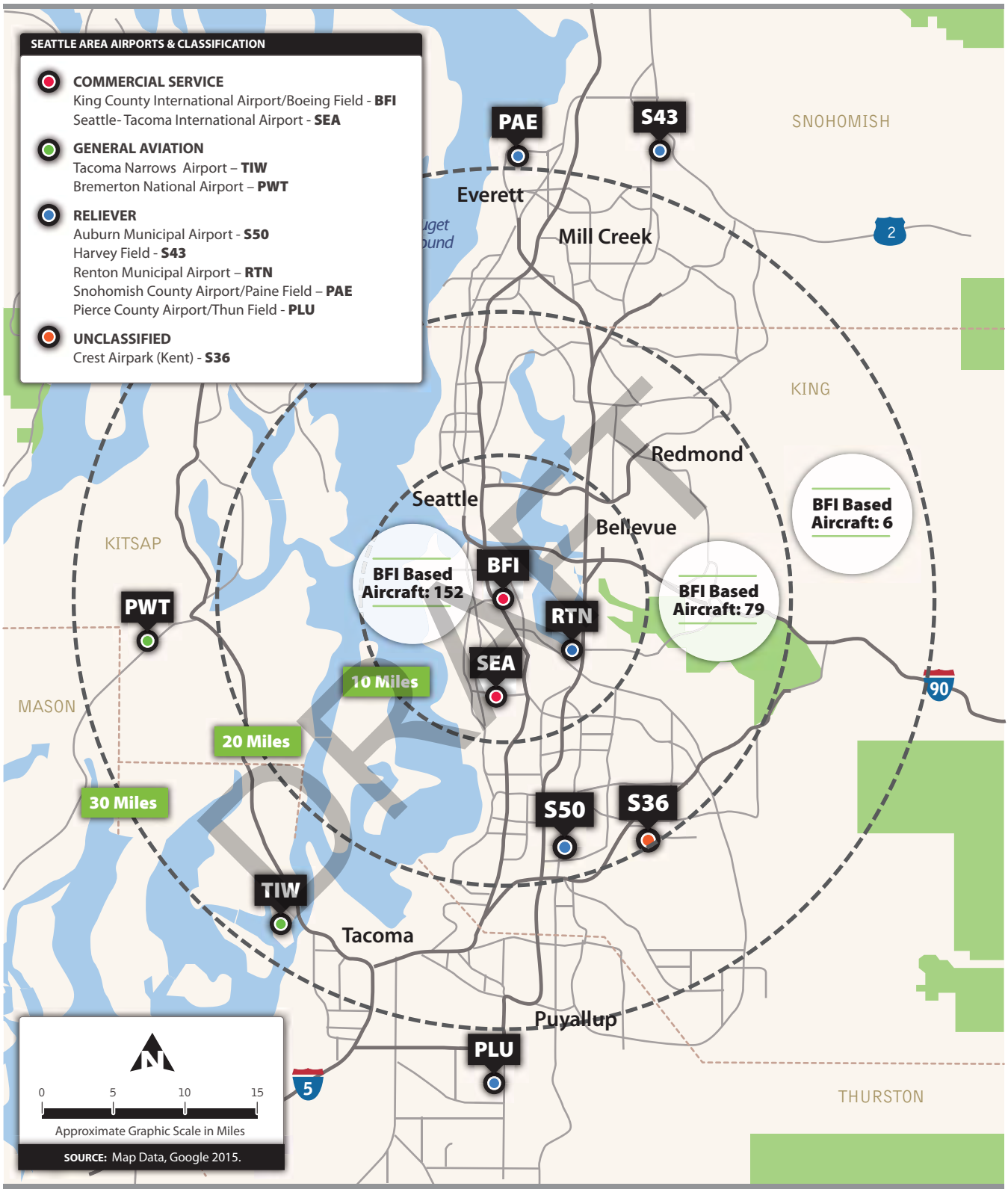


FIGURE B1 **Airport Service Area/ Based Aircraft Owner Locations**

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# King County International Airport/ Boeing Field

## Aviation Industry Trends

For the purpose of providing a broader perspective to the BFI forecasts, the following is an industry overview of the major aviation sector trends and patterns occurring on a nationwide basis, along with a brief high-level overview of the applicable *FAA Aerospace Forecasts Fiscal Year 2016-2036* projections.

**Airline Service.** The regional airline industry, as appropriately described for BFI passenger purposes, has experienced continued declines as the regionals compete for fewer mainline contracts; resulting in slow enplanements and yield growth. The FAA forecast of the domestic regional air carrier sector, quantified by available seat miles and revenue passengers, is expected to increase approximately 1.9% to 2.2% annually over the next 20 years, with an accelerated decline in the air carrier market for 9 to 20 passenger seat aircraft. Over the long term, FAA sees a competitive and profitable aviation industry characterized by increasing demand for air travel and airfares growing more slowly than inflation, reflecting over the long term a growing U.S. economy. At BFI, the scheduled air carrier operators provide a niche service in terms of aircraft equipment, passenger market, and destinations, providing a relatively stable enplanement growth in the past ten years. Most BFI scheduled passengers are transported using 9-seat turboprop commuter aircraft, a trend expected to continue into the forecast planning period. In the future, scheduled passenger service activity at BFI is expected to support the FAA primary commercial service airport role. Despite interest from larger mainline air carriers, further proliferation of scheduled passenger service is not anticipated at BFI due to issues brought about by noise and local transportation barriers.

**Air Cargo**. Significant structural changes have occurred in the air cargo industry, with a maturation of the domestic express market, resulting in total air cargo volumes declining over the last 10 years. The most notable changes have involved the global economy, fuel costs, more stringent FAA and TSA air cargo security regulations, a shift from air to truck modes and greater reliance on all-cargo air carriers for the transport of U.S. Postal Service mail, combined with the decline in mail due to electronic substitutes. Additional factors affecting air cargo growth are fuel price volatility, movement of real yields, and globalization. For forecast purposes, air cargo is derived from demand resulting from economic activity, historically, tracking with gross domestic product. Between 2014 and 2035, real gross domestic product growth is assumed to grow at 2.4% annually, on average, while real disposable personal income is also projected to grow at 2.6% annually over the same period. Growth in all-cargo revenue ton mile (RTM) is expected primarily from increased rates rather than tonnage. The FAA forecast of domestic air cargo, quantified by revenue ton miles, to increase approximately 0.5 to 1.0% annually over the next 20 years, with the strongest growth being international cargo movements, growing at 3.6 to 5.2% annually. The air cargo market at BFI continues to show moderate and stable growth, a trend expected to continue into the forecast planning period.

**Aircraft Manufacturing.** The Boeing Company conducts approximately 4,200 operations at BFI per year in support of their civilian and military aircraft manufacturing, testing, and customer delivery operations, with nearly 90% attributed to the B-737 Series aircraft, 8% by the 787 Series, and 2% combined by the B-767 and B-777 Series. Each Boeing aircraft conducts an average of 3 to 5 test/readiness flights at BFI, prior to the final customer delivery. According to the Boeing *Current Market Outlook 2015-2034*, the Boeing Company plans to deliver 26,730 single-aisle airplanes during the next 20 years. Boeing currently produces 42 B-737 aircraft per month at the Renton facility, or 504 aircraft per year. Recent assembly automation at their nearby Renton plant at RTN for the 737 MAX program is projected to result in an unprecedented production rate of 52 aircraft per month on the new B-737 MAX program by the end of 2018, or 624 aircraft per

year. Eventually, a full B-737 assembly line, at maximum capacity, could theoretically produce up to 63 B-737 aircraft per month, or 756 aircraft per year. For forecast purposes, with strong demand and order backlogs with the B-737, B-767, and B-787 Series, the Boeing Company operations at BFI are expected to increase proportional to the production rates of these aircraft, nearly 5 to 10%, and potentially greater as other aircraft series are developed in the future.

**General Aviation (Business/Corporate).** The use of general aviation for executive business/corporate travel has continued to experience continued growth, as measured by turbine, business jet, and helicopter aircraft deliveries and utilization trends. This general aviation segment has moderately recovered year-to-year since the 2008-2009 economic recession and financial credit crises. This positive activity increase is largely attributable to a bolstered economy, and continued awareness and value in using private aircraft to conduct efficient company travel. The FAA forecasts the turbine general aviation sector, quantified by aircraft fleet, hourly utilization and applicable pilot certifications, to increase approximately 2.9% to 3.6% annually over the next 20 years, with the strongest growth from business jets and turbine helicopters. All segments of the small, medium, and large cabin business jet fleet is undergoing recent manufacturing delivery gains. This overall upward business-class activity trend is apparent at BFI in recent years, as indicative of the net increase of based turbine aircraft, the proportional upgrade to larger-cabin business jets, and prospective tenant interest for basing business operations at BFI.

**General Aviation (Recreational/Training).** The use of general aviation for recreational/training purposes has continued to experience an overall decline, as measured by aircraft production rates, pilot certifications, and operating utilization trends. The single and twin piston aircraft account for the nearly 80% of the nationwide aircraft fleet. The 2008-2009 economic recession resulted in a sharp reduction of general aviation activity nationwide, which have impeded sustained growth for this general aviation sector. This decrease of activity over the past ten years is largely attributable to escalating aircraft operating costs (e.g.; purchase, equipment, maintenance, insurance and fuel), more burdensome airman and aircraft regulatory requirements, safety liability, air carrier hiring woes, and competing interests for personal income and leisure time. The FAA forecast for the piston aircraft sector, primarily quantified by aircraft fleet and hourly utilization, is projected to decline approximately 0.5% to 1.2% annually over the next 20 years. However, the general aviation 'sport aircraft' segment is expected to grow 4% to 5% annually. This downward nationwide general aviation activity level is apparent at BFI since 2008-2009, as confirmed through a decline of general aviation piston operations, flight training activities, number of piston based aircraft, based piston aircraft utilization, and Avgas fuel sales.

An analysis of BFI general aviation operations-per-based-aircraft (OPBA), as the ratio between annual general aviation operations and based aircraft, indicates that BFI based aircraft, on average, are being operated less, and that activity by based aircraft has fallen, relative to the drop in BFI airport operations and in total based aircraft. Factors that contribute to this are assumed to be less flight training, increasing aircraft operating/ownership costs, and other demands on personal discretionary time.

## Forecast Resources

The following is a summary of forecast resources referenced for this MP Update forecast analysis.

### FAA Forecasts

Described below, the FAA provides a basis of forecasts for BFI in terms of reference for overall aviation industry trends and as a BFI forecast baseline. The FAA forecast data is developed from a high-level analysis of industry trends and projections, providing a top-down operational forecast for BFI generally using more aggregate forecast factors as compared with those identified as part of the MP Update.

**FAA Aerospace Forecasts (FY 2016-2036).** The FAA Aerospace Forecast are aeronautical activity projections, by major industry sector, used to understand future demands on the national airport and airspace system. The FAA Aerospace Forecasts are used for the BFI forecasts to assimilate nationwide industry patterns, comprehend the basis for the major forecast rationale and methodology, and to quantify growth patterns and rates of change relative to specific industry activity and utilization components. These FAA projections and rationale are important to BFI given the Airport's operational roles and diversity.

**FAA Terminal Area Forecast (TAF).** The FAA Terminal Area Forecast (TAF) is the official forecast of aviation activity for airports in the National Plan of Integrated Airport Systems (NPIAS), which includes BFI. The TAF documents the year-by-year historical (1990 to 2014) and future (2015 to 2040) aircraft operational and based aircraft activity levels, applying an unconstrained top-down forecast method prepared annually. The FAA TAF values have been used for establishing historical BFI activity values, unless more accurate information was available from other FAA or Airport sources. The FAA TAF forecasts are referenced and compared against the more analytical MP Update forecasts, to demonstrate consistency with FAA forecast expectations. As shown in the **Table B1**, because 2015 is the first FAA TAF forecast year, in some cases (e.g., based aircraft), the FAA TAF is indexed and adjusted to the actual 2015 activity levels in order to close the disparity between 2014, 2015, and 2016 levels. Table B1 is a summarized version of the FAA TAF for BFI.

### Other Forecast Resources

The following existing sources of BFI forecasts, developed by various entities and for various purposes, are referenced for applicability to this MP Update forecast analysis.

**BFI Airport Planning and Forecasting:**

- 1996 BFI Airport Master Plan
- 2008 BFI Aviation Activity Forecast Update
- 2015 BFI Strategic Plan (2015-2020)
- 2009 Washington Aviation System Plan (Update In Process)
- 2009 Washington (WSDOT) Long-Term Air Transportation Study (LATS)
- Puget Sound Regional Council Planning and Transportation Studies
- Surrounding Airport Master Plans

Table B1 **FAA TERMINAL AREA FORECAST (TAF) FOR BFI (1990 to 2035)**

| Year | Passenger Enplaned | Itinerant Operations | Local Operations | Total Operations | Based Aircraft |
|---|---|---|---|---|---|
| 1990 | 8,837 | 209,520 | 122,123 | **331,643** | 533 |
| 1995 | 3,668 | 244,537 | 112,729 | **357,266** | 466 |
| 2000 | 4,343 | 239,783 | 119,843 | **359,626** | 478 |
| 2005 | 21,294 | 211,788 | 86,469 | **298,257** | 472 |
| 2010 | 31,571 | 187,499 | 72,414 | **259,913** | 443 |
| 2011 | 33,110 | 179,707 | 60,995 | **240,702** | 471 |
| 2012 | 22,357 | 151,935 | 46,485 | **198,420** | 427 |
| 2013 | 14,147 | 134,172 | 47,178 | **181,350** | 407 |
| 2014 | 18,851 | 135,052 | 45,923 | **180,975** | 419 |
| **2015 Actual** | **20,214** | **129,648** | **35,923** | **165,571** | **390** |
| 2015* | 25,301 | 127,843 | 43,107 | **170,950** | 423 |
| 2020* | 29,464 | 129,394 | 42,769 | **172,163** | 443 |
| 2025* | 34,323 | 134,887 | 43,835 | **178,722** | 462 |
| 2030* | 39,991 | 140,807 | 44,926 | **185,733** | 482 |
| 2035* | 46,604 | 147,200 | 46,046 | **193,246** | 502 |
| **FAA Forecast % CAGR 2015 to 2035** | **3.1%** | **0.7%** | **0.3%** | **0.6%** | **0.9%** |

*Note: * Denotes FAA TAF Forecast Year.*
*SOURCE: FAA Terminal Area Forecast (TAF) – BFI Airport, Obtained January, 2016.*

## Regional Demographics

Socioeconomic characteristics provide an understanding of demographic patterns within the geographic area served by the Airport. This information provides an understanding with past BFI activity trends, understand the drivers to market area growth, and to substantiate economic projections in connection with developing the BFI forecast of aviation demand. The key socioeconomic data indicators are population, employment, and per capita personal income.

**Table B2** provides a summary, by major socioeconomic category, of the historic and projected socioeconomic trends for the Seattle MSA. The majority of economic indicators point to continued economic growth in the Seattle MSA over the 20 year BFI forecast horizon. As substantiated by the 2013 Puget Sound Regional Council (PSRC) long-range regional economic forecast, a favorable long-term economic outlook for the Seattle MSA is supported by its growing population, well-educated work force, high per capita income, diverse local economy, popularity as a domestic and international tourist destination. According to a 2013 Brookings Study, of the 100 largest nationwide MSA's, Seattle ranked sixth for exports and twelfth for output in 2012. Factors expected to contribute to Seattle's economic growth include: (1) the diversity in the economic base, which lessens its vulnerability to weaknesses in particular industry sectors, (2) growth in the existing and emerging Seattle industry sectors described earlier, (3) an educated labor force able to support

the development of knowledge-based and service industries, and (4) continued reinvestment to support the development of tourism, conventions, and other businesses.

Table B2 **SUMMARY OF SOCIOECONOMIC TRENDS AND PROJECTIONS**

| Economic Segment | % Change - Historical Periods | | | % Change - Forecast Periods | | |
|---|---|---|---|---|---|---|
| | (1970-2015) | (2000-2015) | (2010-2015) | (2015-2035) | (2015-2050) | (2015-2020) |
| Total Population | 1.57% | 1.29% | 2.94% | 1.23% | 1.14% | 1.27% |
| Sub-Population (Ages: 20-75) | 1.96% | 1.54% | 3.40% | 0.93% | 0.98% | 1.04% |
| Sub-Population (Ages: 30-65) | 2.19% | 1.30% | 2.64% | 0.79% | 0.90% | 0.92% |
| Total Employment | 2.39% | 1.03% | 2.63% | 1.44% | 1.32% | 1.61% |
| Total Earnings (2009 $) | 3.60% | 1.66% | 4.45% | 2.19% | 2.08% | 2.34% |
| Total Personal Income (2009$) | 3.64% | 2.11% | 5.05% | 2.31% | 2.13% | 2.47% |
| Net Earning Earnings (2009$) | 3.42% | 1.69% | 4.52% | 2.15% | 2.06% | 2.22% |
| Economic Wealth Index | 0.23% | -0.13% | -0.12% | -0.20% | -0.16% | -0.24% |
| Mean Household Income | 5.28% | 2.59% | 5.79% | 4.27% | 4.49% | 3.19% |
| Total Retail Sales | 3.33% | 2.62% | 4.30% | 1.80% | 1.75% | 2.05% |
| **Composite Average** | **2.93%** | **1.61%** | **3.69%** | **1.90%** | **1.85%** | **1.86%** |

***Note:*** *Existing data is through CY 2015.*
***SOURCE****: Woods & Poole Data. Seattle MSA (42660: Seattle-Tacoma-Bellevue).*

As a key indicator, population in the Seattle metropolitan area has historically increased faster than nationwide rates. Also substantiated by PSRC population growth projected, the Seattle MSA population is projected to increase an average of 1.0% per year between 2013 and 2034, compared with 1.3% for the State, and 1.0% nationwide. When expressed as a compiled socioeconomic average, the overall Seattle MSA market area is expected to grow economically at 1.8 to 1.9% annually, a similar rate as experienced since 2000 (1.6%), but lower than since 2010 (3.7%). Overall, these indicators suggest that BFI would be expected to grow at or above nationwide industry projections for aviation-related activity.

## Airport Related Aviation Forecast and Community Trends

The following sections include industry trends, socioeconomic conditions, community support and other factors that may have either upward or downward influences on the amount of aviation activity and utilization at BFI for the next 20 years. The Consultant relied on the Airport Staff and key BFI users to understand the Airport's general aviation preferences, aircraft utilization, and other factors which could reasonably influence the Airport's general aviation activity projections.

**BFI Upward Activity Influences (+):**

- Commercial-class facility; runway dimension(s), pavement strength, lighting aids, approaches
- Central location within Seattle metropolitan area; close interstate access to Seattle downtown
- Serves growing metropolitan area; population, industry, and commerce
- On-airport business growth; reflecting a net local economic expansion
- Diversity of aviation sectors and aircraft types (passenger service, cargo, corporate, charter, recreational/training, helicopter services)
- Full-service providers (FBO/SASO) for aircraft servicing and pilot/passenger amenities
- Aeronautical service provisions (air traffic control tower, customs)
- Community-based aeronautical services (medical, police, fire & rescue)
- Sustained and expected growing Boeing 737 production/delivery schedules
- Growth in alternative general aviation segments: sport and experimental aircraft
- Existing general aviation hangar wait list demand
- Reasonable rates and charges

**BFI Downward Activity Influences (-):**

- Limited expansion property/space for facilities and tenants
- Proximity and competition from surrounding public-use airports (SEA, RNT, PAE)
- Urban growth and environmental challenges
- Escalating operating costs and regulatory requirements
- Industry decline of the general aviation piston fleet and aircraft utilization

## Passenger Enplanement Forecast

Passenger enplanements have remained fairly consistent, generally ranging between 20,000 and 30,000 passengers since 2004. As reported by FAA, BFI passenger service is conducted as scheduled 'commuter' and non-scheduled 'air carrier' service providers. This passenger service is provided using both turboprop aircraft and large jet transports.

Although the average daily scheduled flights have decreased since 2004, the average scheduled daily enplanements-per-departure have remained consistent. Per the BFI Airport Strategic Plan 2014-2020 study, "while modest growth in passenger demand and operations can be expected at BFI, the passenger market is not expected to exceed the capacity of the existing terminal complex and will remain in the 9-seat commuter aircraft category". The existing scheduled airline (Kenmore Air) is expected to provide a similar level of air service activities into the future; including destinations, aircraft equipment, flight frequencies, passenger

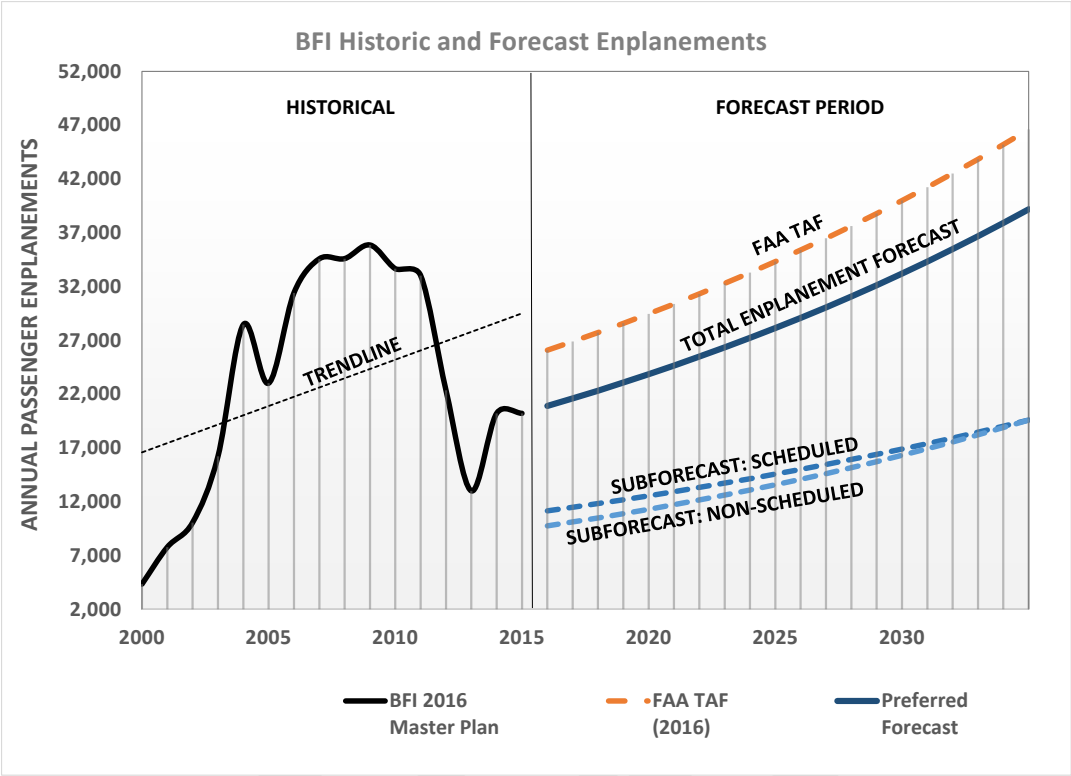
processing levels. Below is a summary of the key 2015 activity indicators for the commercial service passenger operations at BFI.

| | |
|---|---|
| **Total Passengers** | **20,214** |
| ▪ Scheduled Passengers | 10,817 (54%) |
| ○ Domestic (Scheduled) | 10,060 (91%) |
| ○ International (Scheduled) | 1,006 (9%) |
| ▪ Non-Scheduled Passengers (On-Demand) | 9,397 (46%) |
| **Total Flights - Scheduled** | **1,821** |
| ▪ Load Factors (Scheduled) | 66% |
| ▪ Enplaned Passengers Per Arrival (Scheduled) | 5.9 |
| ▪ Average Flights Per Day (Scheduled) | 5.0 |

**Preferred Passenger Enplanement Forecast.** The preferred forecast method applies the BFI historical annual growth rate of 3.3% experienced for total enplanements (scheduled and non-scheduled) from 1990 to 2015 as the constant projected future growth rate, reaching a level near 40,000 enplanements by the end of the planning period. The level of scheduled (air carrier) and non-scheduled (air taxi) passengers was calculated using the 2015 percent difference between scheduled (53%) and non-scheduled (47%), graduated over the 20-year forecast to a 50% to 50% split, indicative of the trend towards a slightly higher proportion of non-scheduled (air taxi) passenger levels.

**Figure B2** graphs the FAA TAF enplanement forecast (combined total of air carrier and commuter) and the recommended MP Update forecast scenario (scheduled and non-scheduled). **Table B3** lists the preferred enplanement forecast, including annual forecast growth rates. The 20-year FAA TAF forecast indicates an increase of total enplanements, from about 25,000 in 2015 to 46,000 by 2035, equating to a 2.9% annual growth rate. In the future, the air passenger forecast scenario reflects a growth of scheduled air carrier load factors similar with past BFI passenger trends and a strengthening of non-scheduled 'on-demand' passenger service, including frequent flights operating under the Justice Prisoner and Alien Transportation System (JPATS) program.

Figure B2 **BFI PASSENGER ENPLANEMENT ACTIVITY TRENDS AND FORECAST SCENARIO**




***SOURCE**: Historical: FAA T-100, USDOT BTS Website (March, 2016)*
*Forecast: FAA TAF (2015 to 2035)| Consultant Forecast (2015 to 2035) March, 2016*

Table B3 **BFI PASSENGER ENPLANEMENTS (2000 TO 2035)**

| Year | FAA TAF | MP Update Forecast (Passenger Enplanements) | | |
|---|---|---|---|---|
| | | Scheduled | Non-Scheduled | Total |
| 2000 | 4,343 | -- | -- | 4,343 |
| 2001 | 7,776 | -- | -- | 7,776 |
| 2002 | 7,273 | -- | -- | 10,069 |
| 2003 | 14,210 | -- | -- | 16,220 |
| 2004 | 29,447 | -- | -- | 28,458 |
| 2005 | 21,294 | -- | -- | 23,016 |
| 2006 | 29,439 | -- | -- | 31,418 |
| 2007 | 27,352 | -- | -- | 34,580 |
| 2008 | 34,838 | -- | -- | 34,597 |
| 2009 | 32,023 | -- | -- | 35,863 |
| 2010 | 31,571 | -- | -- | 33,656 |
| 2011 | 33,110 | -- | -- | 33,023 |
| 2012 | 22,357 | -- | -- | 22,357 |
| 2013 | 14,147 | -- | -- | 13,008 |
| 2014 | 18,851 | -- | -- | 20,214 |
| 2015 | 25,301 | 10,817 | 9,397 | 20,214 |
| 2020 | 29,464 | 12,555 | 11,297 | **23,852** |
| 2025 | 34,323 | 14,567 | 13,578 | **28,144** |
| 2030 | 39,991 | 16,896 | 16,313 | **33,209** |
| 2035 | 46,604 | 19,593 | 19,593 | **39,186** |
| **% CAGR** | **3.10%** | **3.01%** | **3.74%** | **3.37%** |

***Note:*** *2015 BFI passenger enplanements not yet officially published, 2014 level carried forward to 2015.*
***SOURCE****: Historical: FAA T-100, USDOT BTS Website (March, 2016)*
***SOURCE****: Forecast: FAA TAF (2015 to 2035)| Consultant Forecast (2015 to 2035) March, 2016*

As displayed in **Table B4**, BFI aircraft passenger operations are conducted by 'scheduled' (49.9%) and 'non-scheduled' (50.1%) commercial air carrier operators, totaling 3,646 operations in 2015. The forecast of 'scheduled' operations was projected at a rate (1.3%) comparable with BFI passenger demand levels, and also an increase reflective of recent-past BFI commercial passenger levels, provided a similar flight schedule, aircraft equipment, and load factor. The forecast of non-scheduled operations is expected to be more reflective of industry-wide air-taxi passenger demand rates (2.2% CAGR), which is reasonable for BFI as the result of a stable on-demand market of specialized travel programs conducted at BFI. During the 20-year forecast period, total commercial passenger aircraft operations are projected to increase from 3,646 to 5,179, a 1.77% annual growth.

Table B4 **COMMERCIAL PASSENGER SERVICE OPERATIONS PROJECTIONS**

| Year | Scheduled Air Carrier Passenger Operations | % Scheduled (Commuter) | Non-Scheduled Air Carrier Passenger Operations | % Non-Scheduled (Air Carrier) | Total Air Passenger Aircraft Operations |
|---|---|---|---|---|---|
| 2015 (Actual) | 1,821 | 49.9% | 1,825 | 50.1% | **3,646** |
| 2020 | 1,942 | 48.8% | 2,035 | 51.2% | **3,977** |
| 2025 | 2,072 | 47.7% | 2,269 | 52.3% | **4,341** |
| 2030 | 2,210 | 46.6% | 2,529 | 53.4% | **4,739** |
| 2035 | 2,358 | 45.5% | 2,820 | 54.5% | **5,178** |
| **CAGR 2015-2035** | **1.30%** | -- | **2.20%** | -- | **1.77%** |

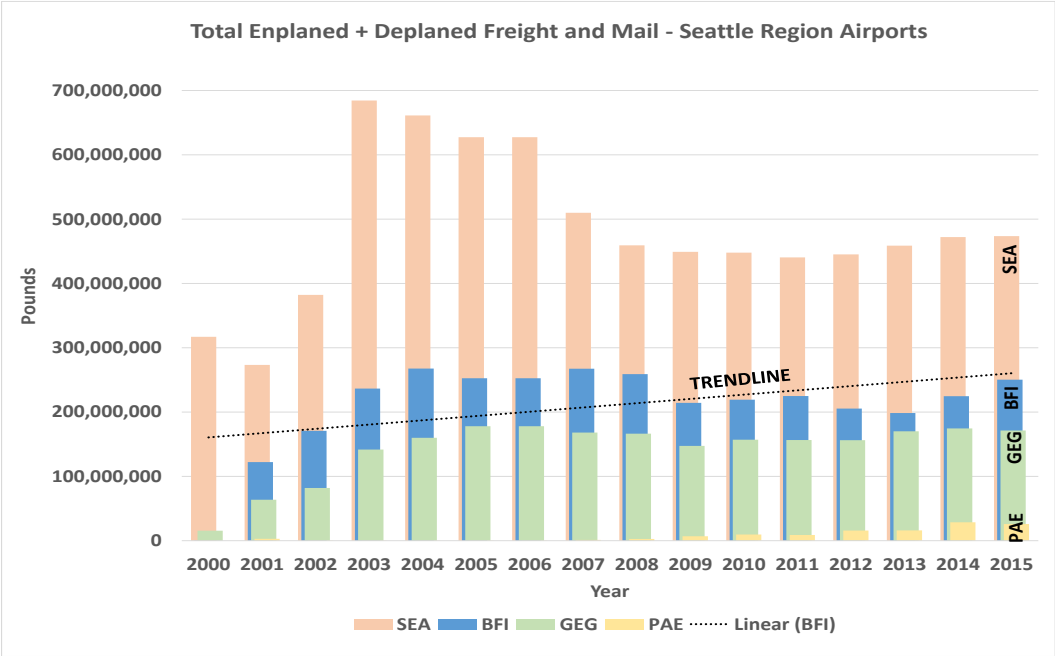
***SOURCE**: Base Year: Airport Records*
*Forecast: Consultant Forecast (2016 to 2035), Conducted March, 2016*

## Air Cargo Forecast

Air cargo at BFI represents a large sector and high-valued market of aviation activity. In 2014 BFI ranked as the 27th busiest cargo airport in the country, recording a landed weight of 407,629 tons, an increase of 7.35% from 2013 data. The BFI international air cargo carriers are most commonly routed through west coast hubs or Anchorage. BFI's proximity to the Seattle Central Business District makes it a desirable location for air cargo, and efforts by the airport management to work with these cargo operators/tenants to meet their needs, despite tight physical constraints, have been beneficial to both the tenant and the Airport.

The USDOT T-100 and FAA's Air Carrier Activity Information System (ACAIS) are the resource basis for the historical BFI and regional air cargo (freight and mail) activity, broken-down further by enplaned, deplaned, cargo operator, operations, and aircraft flight frequency (see **Figure B3** below). BFI air cargo activity for both domestic and international destinations has generally continued to increase since 2005, as quantified in terms of enplaned/deplaned pounds, aircraft landing weights, and revenue ton miles. In the past 10 years, BFI has experienced 2.3 to 3.4 million pounds of air cargo annually. On average, freight constitutes 97% of the total BFI cargo volume weight, compared to mail at 3%. Nearly 73% of the air cargo transport operations are conducted by wide-body aircraft, predominately the B-767-200 & 300 series aircraft, but also the MD-11 and the B-747 in previous years.

Figure B3 **CARGO COMPARISONS (BFI 'SCHEDULED' AIR CARGO VOLUMES)**




***SOURCE:*** *FAA T-100 Cargo Data; USDOT BTS Website (Obtained March, 2016)*

**Table B5** is a summary of the 2015 BFI 'scheduled' air cargo carriers, broken down type of aircraft for percent of cargo flights/operations and total annual landing weights. UPS and ABX (formerly Airborne Express) are the largest cargo operators, which constitutes over 85% of the total cargo landing weight (volume).

Table B5 **BFI 'SCHEDULED' AIR CARGO OPERATORS AND ACTIVITY (2015)**

| Cargo Carrier | Aircraft Weight | Total Landings | % Landings | Total Landing Weight | % Landing Weight |
|---|---|---|---|---|---|
| **ABX** | -- | **789** | **12.8%** | **214,841,000** | **26.4%** |
| B-767 | 277,000 | 44 | -- | 12,188,000 | -- |
| B-767-200 | 272,000 | 744 | -- | 202,368,000 | -- |
| B-767-200ER | 285,000 | 1 | -- | 285,000 | -- |
| **AIRPAC Airlines** | -- | **1,005** | **16.3%** | **6,168,000** | **0.8%** |
| Piper PA-31-350 | 7,250 | 588 | -- | 4,263,000 | -- |
| Piper PA-31-34 | 3,470 | 417 | -- | 1,905,000 | -- |
| **Ameriflight** | -- | **1,985** | **32.2%** | **30,301,300** | **3.7%** |
| Beech B-99 | 10,400 | 198 | -- | 2,059,200 | -- |
| Beech C-99 | 1,300 | 623 | -- | 7,039,900 | -- |
| Beech 1900 | 16,100 | 482 | -- | 7,760,200 | -- |
| EMB-120 | 25,794 | 335 | -- | 8,640,000 | -- |
| F-227 | 14,000 | 339 | -- | 4,746,000 | -- |
| Piper Navajo PA-31-350 | 7,000 | 8 | -- | 56,000 | -- |
| **BAX Global** | -- | **227** | **3.7%** | **44,946,000** | **5.5%** |
| B-767-200 | 198,000 | 227 | -- | 44,946,000 | -- |
| **Martinaire** | -- | **252** | **4.1%** | **2,142,000** | **0.3%** |
| Cessna 208 | 8,500 | 252 | -- | 2,142,000 | -- |
| **Nolinor Aviation** | -- | **171** | **2.8%** | **18,297,000** | **2.2%** |
| B-737-200 | 107,000 | 171 | -- | 18,297,000 | -- |
| **Northern Air Cargo** | -- | **31** | **0.5%** | **3,450,000** | **0.4%** |
| B-737-200 | 107,000 | 12 | -- | 1,284,000 | -- |
| B-737-300 | 114,000 | 19 | -- | 2,166,000 | -- |
| **UPS** | -- | **1,708** | **27.7%** | **495,112,000** | **60.7%** |
| Airbus A300-600 | 315,000 | 16 | -- | 5,040,000 | -- |
| B-757-200PF | 210,000 | 576 | -- | 120,960,000 | -- |
| B-767-300F | 326,000 | 1,084 | -- | 353,384,000 | -- |
| MD-11 | 491,500 | 32 | -- | 15,728,000 | -- |
| **TOTAL/AVERAGE** | **139,816** | **6,168** | **100.0%** | **815,257,300** | **100.0%** |

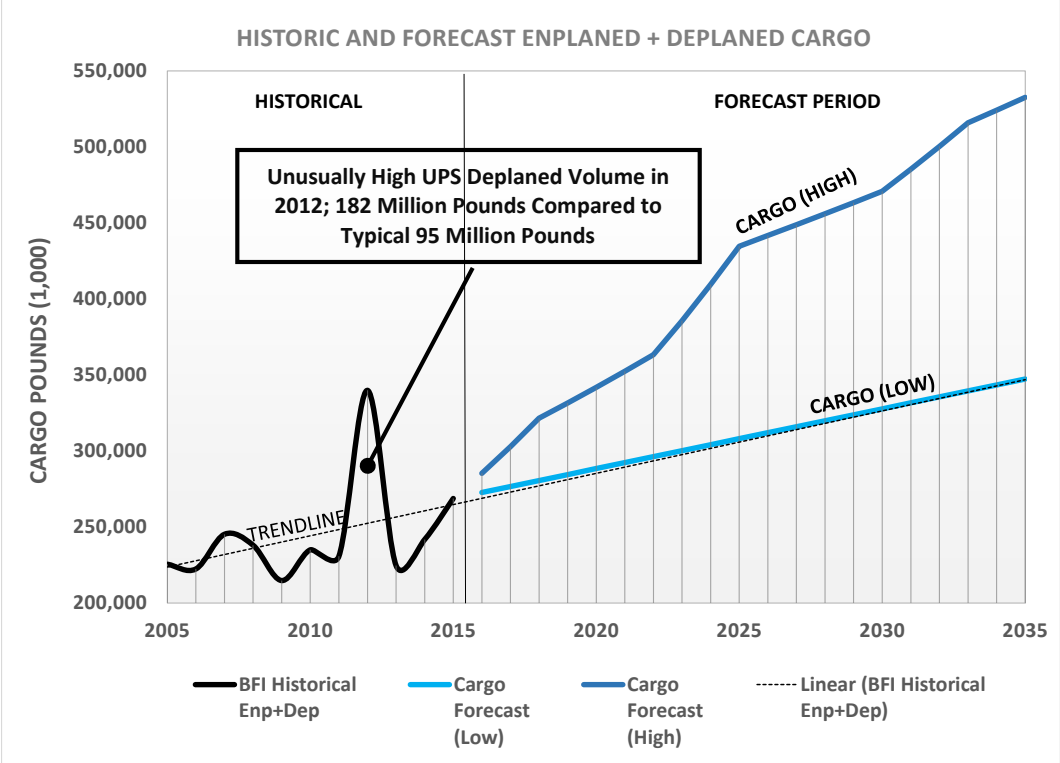
***Note:*** *BAX Global anticipated to relocate cargo operations from BFI to SEA during 2016.*
***SOURCE****: FAA T-100 Cargo Data; USDOT BTS Website (Obtained March, 2016)*

The following series of figures illustrate the historical BFI air cargo activity, and expected forecast scenario(s). See **Figure B4** for BFI enplaned and deplaned air cargo totals and forecast scenario(s). See

**Figure B5** for BFI air cargo landing weight totals and forecast scenario(s). See **Figure B6** for BFI cargo revenue ton mile totals and forecast scenario(s).

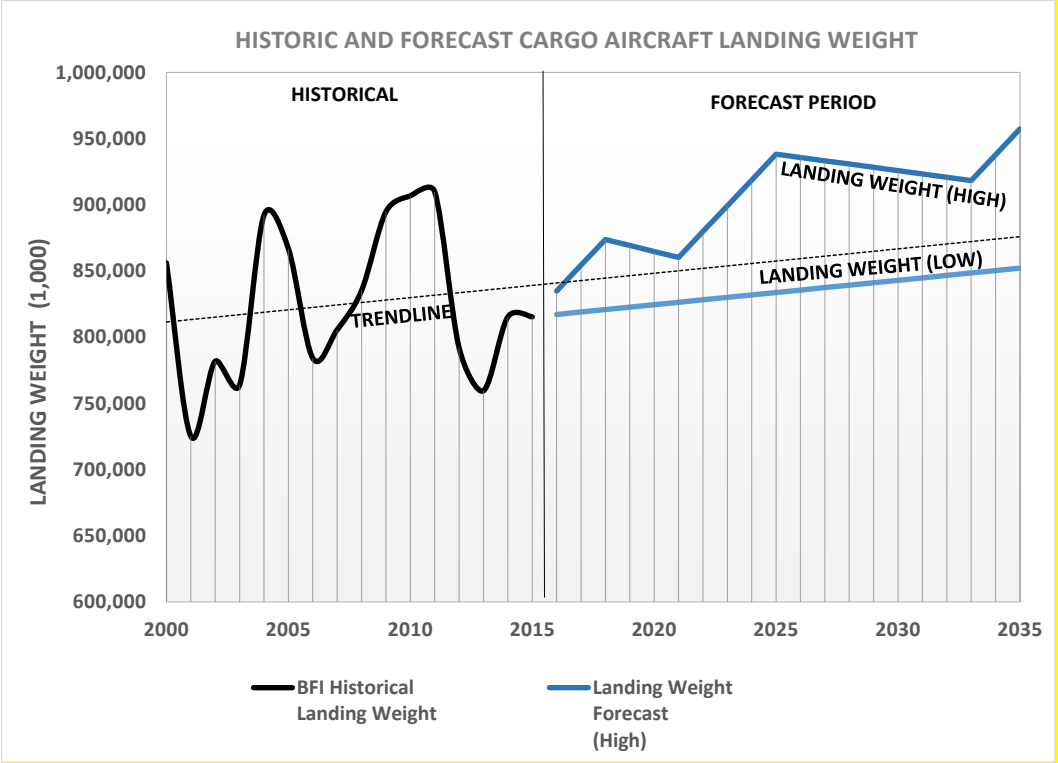
**Preferred Air Cargo Forecast(s).** The cargo pounds forecast was calculated using the past 10 year net increase versus decrease of total enplaned plus deplaned volumes, generating an average annual increase of 3.9 million pounds, which equates to 1.3% annual growth (i.e., the "High" forecast). The cargo aircraft landing weight forecast was calculated using historical percent growth rates over the past 15 years (-0.3%, -2.7%, +2.4%) applied to the 3 to 5 year historical rate of change cycle, which also corresponds with the ratio pattern of aircraft cargo weights to total cargo pounds, that ranges between 0.26 to 0.43. This equates to a forecast annual growth of 1.8 million pounds, or an average annual rate increase of 0.22% (i.e., the "Low" forecast). The cargo revenue ton mile forecast was derived from the historical 2000 to 2015 trend line analysis, which results in a forecast annual growth rate of 0.96 percent (i.e., the "Low" forecast), or about 375,000 additional revenue ton miles per year, and is comparable to the historical net annual increase of 296,000 revenue ton miles. Being a derivative cargo component, the revenue ton mile forecast remains consistent with the cargo pound and aircraft weight forecast levels.

Figure B4 **BFI ENPLANED AND DEPLANED AIR CARGO TOTALS AND FORECAST SCENARIO(S)**



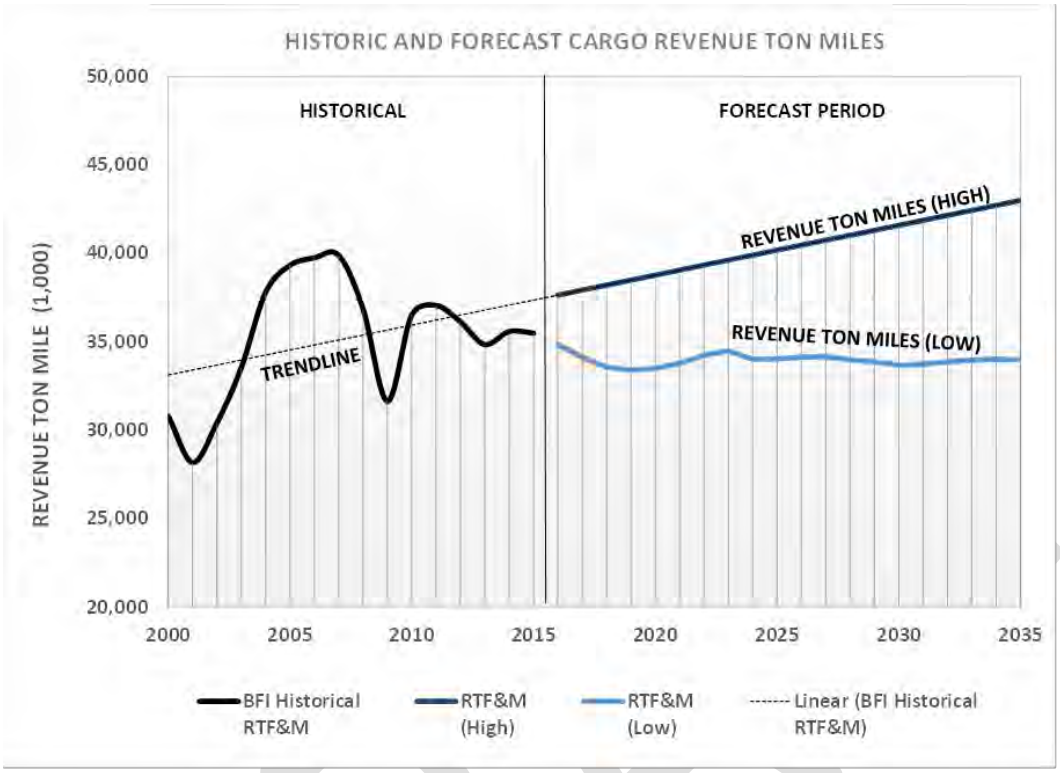

***SOURCE**: FAA T-100 Cargo Data; USDOT BTS Website (Obtained March, 2016)*

Figure B5 **BFI AIR CARGO LANDING WEIGHT TOTALS AND FORECAST SCENARIO(S)**




***SOURCE**: FAA T-100 Cargo Data; USDOT BTS Website (Obtained March, 2016)*

Figure B6 **BFI CARGO REVENUE TON MILE TOTALS AND FORECAST SCENARIO(S)**




***SOURCE**: FAA T-100 Cargo Data; USDOT BTS Website (Obtained March, 2016)*

**Table B6** is a summary of the preferred cargo forecast components, including total (enplaned + deplaned) freight and mail cargo pounds, total aircraft landing weights, and cargo revenue ton miles. A continued growth of air cargo volumes, landing weights, and aircraft operations at BFI is projected, largely in response to the overall air cargo growth activities persisting throughout the Seattle region. Providing adequate and competitive air cargo terminal facilities and landside infrastructure space at BFI is a challenge in expanding the air cargo market.

Table B6 **BFI CARGO FORECAST SUMMARY (2000 TO 2035)**

| Year | Total Cargo Pounds (Low) | Total Cargo Aircraft Landing Weight (High) | Cargo Revenue Ton Miles (High) |
|---|---|---|---|
| 2000 | N/A | 856,064 | 30,804 |
| 2001 | N/A | 725,073 | 28,173 |
| 2002 | N/A | 781,775 | 30,418 |
| 2003 | N/A | 763,814 | 33,536 |
| 2004 | N/A | 892,135 | 37,805 |
| 2005 | 225,510 | 866,799 | 39,325 |
| 2006 | 222,380 | 784,085 | 39,747 |
| 2007 | 245,196 | 805,504 | 39,887 |
| 2008 | 237,994 | 835,114 | 36,853 |
| 2009 | 214,736 | 894,665 | 31,638 |
| 2010 | 234,960 | 906,716 | 36,529 |
| 2011 | 230,694 | 909,809 | 37,060 |
| 2012 | 339,860 | 791,929 | 36,121 |
| 2013 | 224,617 | 759,445 | 34,842 |
| 2014 | 241,744 | 815,259 | 35,584 |
| 2015 | 268,741 | 815,259 | 35,488 |
| **2020** | **288,391** | **824,468** | **38,767** |
| **2025** | **308,041** | **833,677** | **40,179** |
| **2030** | **327,692** | **842,885** | **41,590** |
| **2035** | **347,342** | **852,094** | **43,002** |
| **% CAGR** | **1.29%** | **0.22%** | **0.96%** |

***SOURCE**: Historical: FAA T-100 Cargo Data, USDOT BTS Website (March, 2016)*
*Forecast: Consultant Forecast (2016 to 2035), Conducted March, 2016*

As displayed in Table B7, BFI aircraft cargo operations totaled 12,336 operations in 2015, as indicated by aircraft type. Traffic consists evenly of transport versus non-transport aircraft operations, in which nearly 75 percent of operations are conducted by widebody planes (B-767, MD-11, A-300), and 25 percent by narrowbody planes (B-737, B-757). The operations forecast was projected at an annual rate (1.0%) consistent with the other BFI air cargo activity components (enplaned/deplaned pounds, aircraft landing weights, revenue-ton-miles). Also, it is anticipated the BFI air cargo aircraft fleet will remain fairly constant throughout the forecast period, in terms of the types of carriers, freight and mail delivery logistics, aircraft fleet composition, and domestic and international routes. During the 20-year forecast period, total air cargo aircraft operations are projected to increase from 12,336 to 15,052, a 1.0% annual growth.

Table B7 **AIR CARGO CARRIER OPERATIONS PROJECTIONS**

| Year | Transport Aircraft | Narrowbody Transport Aircraft | Widebody Transport Aircraft | Non-Transport Aircraft | Total Air Cargo Aircraft Operations |
|---|---|---|---|---|---|
| 2015 (Actual) | 5,852 | 1,556 | 4,296 | 6,484 | 12,336 |
| 2015 (Actual %) | 47.4% | 26.6% | 73.4% | 52.6% | -- |
| 2020 | 6,150 | 1,635 | 4,515 | 6,815 | 12,965 |
| 2025 | 6,464 | 1,719 | 4,746 | 7,163 | 13,627 |
| 2030 | 6,794 | 1,807 | 4,988 | 7,528 | 14,322 |
| 2035 | 7,140 | 1,899 | 5,242 | 7,912 | 15,052 |
| CAGR 2015-2035 | 1.00% | -- | -- | 1.00% | 1.00% |

***SOURCE**: Base Year: Airport Records Forecast: Consultant Forecast (2016 to 2035), Conducted March, 2016*

## General Aviation Aircraft Operations

A more comprehensive forecast understanding of general aviation activity at BFI involves an individual assessment of general aviation operations by major user component; which includes Air Taxi, Business/Corporate, and Recreational/Training. These general aviation components are individually characterized and influenced by unique user and industry operator factors, and are analyzed by segment in order to develop a more complete projection of future general aviation activity levels as a whole. These factors were considered and incorporated into the development of the general aviation operation projections. The results of the forecasting effort for the general aviation categories are discussed below and are presented in Table B13.

- **General Aviation – Air Taxi.** Air taxi operations at BFI are generally classified as any company or individual performing air passenger transportation service on a nonscheduled basis over unspecified routes utilizing general aviation-type aircraft. It is assumed that this segment of general aviation activity will increase by 1.36% CAGR throughout the forecast period largely in response to the Seattle passenger market volume and air transportation values, proximity of BFI to Seattle business and entertainment districts, and air taxi services offered or arranged by based BFI charter operators.

- **General Aviation – Business/Corporate.** The business/corporate segment, as reflective of national trends, is projected to expand at BFI as realized through higher activity utilization, based aircraft types and assets, and diversity of aircraft and pilot operator services. The largest gains are expected from turbine aircraft; including both fixed wing and helicopter operators. This growth is evident through continued growth of corporate aircraft acquisition, higher utilization resulting from stronger national economic conditions, and the continued proliferation and expansion of the fractional ownership program. This segment of operations is expected to increase from 26,404 in 2015 to 46,418 in 2035, a CAGR of 2.86%.

- **General Aviation – Recreational/Training.** As the result largely attributed to the continued decline in piston aircraft utilization, pilot training, and fleet production rates nationwide, the recreational/training segment at BFI is also expected to experience a continued decline. By 2025, it is expected the BFI activity declines experienced during the past ten years would "bottom out" and start to stabilize and rebound, as the result of a more established pilot population, infusion of economical aircraft technologies, and industry-wide adaption to operating costs and evolving aircraft/airmen regulatory requirements. However, the rebound by 2035 of 68,755 operations is still well below the 2015 operations of 96,876, reflecting a CAGR of -1.7%.

- **Total General Aviation.** As presented in **Table B8**, the total operations by general aviation aircraft is expected to decrease by a CAGR of -0.06. This is reflective of the larger numerical decrease associated with recreational/training activity compared to the smaller increases numerically by air taxi and business/corporate activity.

Table B8 **GENERAL AVIATION AIRCRAFT OPERATIONS PROJECTIONS**

| Year | Total General Aviation | General Aviation – Air Taxi | General Aviation – Business/Corporate | General Aviation – Recreational/Training |
|---|---|---|---|---|
| 2015 (Actual) | **143,783** | 20,503 | 26,404 | 96,876 |
| 2020 | **135,430** | 21,937 | 30,403 | 83,090 |
| 2025 | **127,151** | 23,470 | 35,009 | 68,672 |
| 2030 | **134,394** | 25,110 | 40,312 | 38,972 |
| 2035 | **142,039** | 26,866 | 46,418 | 68,755 |
| **CAGR** | **-0.06%** | **1.36%** | **2.86%** | **-1.7%** |

***SOURCE**: Forecast: Consultant Forecast (2015 to 2035), Conducted March 2016.*

## Aircraft Operations Forecast

Aircraft operations, defined as either a takeoff or a landing, is a forecast component to determine the year-by-year total number of annual operations, as broken down by user category, aircraft type, and other operational parameters. In 2015, a total of 165,571 operations occurred at the Airport. Below is a summary of the key 2015 operational mix parameters:

| | | |
|---|---|---|
| **Total Operations:** | **165,571** | |
| ▪ Air Carrier: | 10,895 | (6.6%) |
| ▪ Air Taxi: | 28,809 | (17.4%) |
| ▪ General Aviation: | 124,050 | (74.9%) |
| ▪ Military: | 1,816 | (1.19%) |
| ▪ Itinerant Traffic: | 125,041 | (75.8%) |
| ▪ Local Traffic: | 40,550 | (24.5%) |
| ▪ IFR Traffic: | 107,483 | (65.0%) |
| ▪ VFR Traffic: | 58,088 | (35.0%) |
| ▪ Business: | 85,302 | (51.5%) |
| ▪ Recreational/Training: | 80,269 | (48.5%) |

## Forecast of Aircraft Operating Mix – Aircraft Types

The following lists the aircraft operational mix, by major user group, as estimated for in 2007 and 2015. For comparative purposes, 2007 was the last available year with a full assessment of the BFI operational fleet mix, as conducted for the 2008 *BFI Aviation Forecast Update Report*. Similarly as done in 2007, the 2015 fleet mix was generated from the bottom-up, compiled from Airport/ATCT operational records and FAA published information. The 2015 aircraft mix is also reflective of recent-past BFI trends, including key user/tenant activities, based aircraft types, and fuel sale records.

| **Aircraft Type** | **2007** | **2015** |
|---|---|---|
| ▪ Piston: | 64% | 62% |
| ▪ Turboprop: | 10% | 14% |
| ▪ Business Jet: | 14% | 10% |
| ▪ Transport Jet: | 4% | 8% |
| ▪ Helicopter: | 8% | 6% |

**Table B9** is the forecast of total annual operations broken-down by major user category, including the percent annual growth rate over the 20-year forecast period.

Table B9 **FORECAST OPERATIONS MIX – USER CATEGORY**

| Year | Airline | Air Cargo | Boeing | General Aviation (Air Taxi) | General Aviation (Bus/Rec) | Military | TOTAL |
|---|---|---|---|---|---|---|---|
| 2015 | 3,646 | 12,336 | 4,198 | 20,503 | 123,280 | 1,608 | **165,571** |
| 2020 | 3,889 | 12,965 | 5,197 | 21,979 | 113,538 | 1,669 | **159,239** |
| 2025 | 4,149 | 13,627 | 6,297 | 23,562 | 103,782 | 1,733 | **153,148** |
| 2030 | 4,425 | 14,322 | 6,553 | 25,258 | 109,451 | 1,799 | **161,807** |
| 2035 | 4,721 | 15,052 | 6,819 | 27,076 | 115,420 | 1,867 | **170,956** |
| % CAGR | 1.3% | 1.0% | 2.5% | 1.4% | -0.3% | 0.8% | **0.2%** |

***Note:*** *TAF projections of commercial operations include air cargo operations and some general aviation air taxi operations. The airport forecasts include only operations on commercial service airlines. For the purpose of this MP Update, air cargo operations have been developed separately and air taxi operation have been included in general aviation operations projections.*
***SOURCE****: Forecast: Consultant Forecast (2016 to 2035), Conducted March, 2016*

**Table B10** is the forecast of total annual operations broken-down by major aircraft type, including the percent annual growth rate over the 20-year forecast period. In the future, a further increase of BFI transport aircraft utilization is expected, attributed mainly to air cargo operators, more frequent on-demand passenger service, and Boeing aircraft production/delivery schedules. Also, there is expected to be a further concentration of based corporate and specialized high-end general aviation service tenants. Historical BFI piston and turboprop general aviation fleet mix trends are expected to continue, largely coincident with the nationwide piston/turboprop aircraft manufacturing and utilization rates. Otherwise, economic and regulatory factors are assumed to induce a cyclical pattern to this overall BFI activity pattern.

Table B10 **FORECAST OPERATIONS MIX – AIRCRAFT TYPE**

| Year | Piston | Turboprop | Business Jet | Transport Jet | Helicopter | TOTAL |
|---|---|---|---|---|---|---|
| 2015 | 102,480 | 22,459 | 16,425 | 13,483 | 10,725 | **165,571** |
| 2020 | 88,177 | 24,412 | 19,570 | 14,668 | 12,412 | **159,239** |
| 2025 | 72,974 | 26,534 | 23,318 | 15,958 | 14,364 | **153,148** |
| 2030 | 71,198 | 28,842 | 27,783 | 17,361 | 16,623 | **161,807** |
| 2035 | 68,377 | 31,350 | 33,104 | 18,888 | 19,237 | **170,956** |
| % CAGR | -2.0% | 1.7% | 3.6% | 1.7% | 3.0% | **0.2%** |

***SOURCE****: Forecast: Consultant Forecast (2016 to 2035), Conducted March, 2016*

**Table B11** is the forecast of forecast of total operations conducted as itinerant and local, and actual instrument (IFR) and visual (VFR) conditions. Itinerant and VFR operations will continue to be the dominant

aircraft activity at BFI. It is expected the Airport will maintain a similar operational profile throughout the planning period.

Table B11 **FORECAST OPERATIONS MIX – OPERATION TYPE**

| Year | Total Itinerant Operations | Total Local Operations | Total IFR | Total VFR |
|---|---|---|---|---|
| 2015 | 125,041 (76%) | 40,530 (24%) | 58,088 (35%) | 107,483 (65%) |
| 2020 | 120,259 (76%) | 38,980 (24%) | 55,866 (35%) | 103,372 (65%) |
| 2025 | 115,659 (76%) | 37,489 (24%) | 53,730 (35%) | 99,419 (65%) |
| 2030 | 122,198 (76%) | 39,609 (24%) | 56,768 (35%) | 105,040 (65%) |
| 2035 | 129,107 (76%) | 41,848 (24%) | 59,977 (35%) | 110,978 (65%) |
| **% CAGR** | **0.2%** | **0.2%** | **0.2%** | **0.2%** |

***SOURCE**: Forecast: Consultant Forecast (2016 to 2035), Conducted March, 2016.*

## Operational Peaking

**Table B12** is the operational peaking forecast of total annual operations broken-down by month, day, and hour. Operational peaking is used to assess airfield user patterns, quantify capacity levels, and to analyze various facilities for level of service. The design-day and design-hour activity levels are reflective of the Airport's busy periods, rather than the absolute peak periods, in order to avoid constructing for capacity rarely used. Peaking activity is derived from the aggregate annual Airport operations, calculated using FAA guidance, and substantiated by monthly Air Traffic Control activity records. Per FAA ATADS data, the peak-month activity typically occurs from May to August, with the highest average peak-month of 11.4% experienced in July and/or August. The percent of peak-hour operations is estimated using FAA guidance to range between 12 to 18%.

Table B12 **OPERATIONAL PEAKING (ANNUAL, MONTH, DAY AND HOUR)**

| Operational Peaking | Peaking Calculation | Activity Demand (Civilian Operations) | | | | |
|---|---|---|---|---|---|---|
| | | 2015 | 2020 | 2025 | 2030 | 2035 |
| **Total Annual Operations** | -- | **165,571** | **159,239** | **153,148** | **161,807** | **170,956** |
| Peak Month Operations | 11.4% | 18,957 | 18,232 | 17,534 | 18,526 | 19,573 |
| Average Day Peak Month | 30.5 Days | 622 | 598 | 575 | 607 | 642 |
| Peak Hour | 15.0% | 93.2 | 89.7 | 86.2 | 91.1 | 96.3 |
| Peak Hour - Itinerant | 75.5% | 35.2 | 33.9 | 32.6 | 34.4 | 36.3 |
| Peak Hour - Local | 24.5% | 11.4 | 11.0 | 10.6 | 11.2 | 11.8 |
| Peak Hour - IFR | 35.1% | 16.4 | 15.7 | 15.1 | 16.0 | 16.9 |
| Peak Hour - VFR | 64.9% | 30.3 | 29.1 | 28.0 | 29.6 | 31.2 |

***SOURCE**: Forecast: Consultant Forecast (2016 to 2035), Conducted March, 2016.*

## General Aviation Based Aircraft Forecast

The number and type of based aircraft influences airfield operational system needs and influences the type and location of building facilities, along with the space allocation. Given the constrained terminal and landside property at BFI, based aircraft forecasts have a direct relationship to the function, utilization, and value of future airport property assets.

For 2015, the BFI Airport records total 390 based aircraft:

- Single-engine piston: 188 (49%)
- Multi-engine piston: 42 (11%)
- Single-engine turboprop: 15 (4%)
- Multi-engine turboprop: 18 (5%)
- Small cabin business Jet: 39 (10%)
- Large cabin business Jet: 47 (12%)
- Helicopter: 31 (5%)

Since 2006, there has been a precipitous decline in total number of based aircraft, dropping from around 500 to 380, with an average loss of three (3) based aircraft per year, with higher rates of 10 to 15 based aircraft experienced in the most recent years (see **Table B13** for breakdown). Also, as indicated by the lower table information, there has not been significant change in the percent of based aircraft from year-to-year, by type. The most significant change is the proportional increase of based jets. The BFI Airport staff foresees stability in hangar demand for all types of aircraft, with increasing demand for larger turbine aircraft. The property availability and economic returns for hangar space constraints will be an on-going challenge.

Table B13 **BFI HISTORICAL BASED AIRCRAFT BREAKDOWN - TYPE AND PERCENT (2006-2015)**

| Year | Single Engine | Multi Engine | Jet | Rotorcraft | Military | Total Civilian | Grand Civilian |
|---|---|---|---|---|---|---|---|
| **AIRCRAFT NUMBER** | | | | | | | |
| 2006 | 269 | 72 | 90 | 42 | 18 | 473 | 491 |
| 2007 | 264 | 84 | 82 | 42 | 18 | 472 | 490 |
| 2008 | 189 | 107 | 82 | 42 | 18 | 420 | 438 |
| 2009 | 257 | 86 | 65 | 31 | 24 | 439 | 463 |
| 2010 | 250 | 105 | 59 | 33 | 19 | 447 | 466 |
| 2011 | 237 | 79 | 76 | 32 | 2 | 424 | 426 |
| 2012 | 237 | 79 | 76 | 32 | 2 | 424 | 426 |
| 2013 | 233 | 75 | 77 | 32 | 1 | 417 | 418 |
| 2014 | 217 | 63 | 82 | 34 | 0 | 396 | 396 |
| 2015 | 203 | 60 | 86 | 31 | 0 | 380 | 380 |
| 2006-2015 Δ | -66 | -12 | -4 | -11 | -18 | -93 | -111 |
| **AIRCRAFT PERCENTAGE** | | | | | | | |
| 2006 | 54.8% | 14.7% | 18.3% | 8.6% | 3.7% | -- | 100% |
| 2007 | 53.9% | 17.1% | 16.7% | 8.6% | 3.7% | -- | 100% |
| 2008 | 43.2% | 24.4% | 18.7% | 9.6% | 4.1% | -- | 100% |
| 2009 | 55.5% | 18.6% | 14.0% | 6.7% | 5.2% | -- | 100% |
| 2010 | 53.6% | 22.5% | 12.7% | 7.1% | 4.1% | -- | 100% |
| 2011 | 55.6% | 18.5% | 17.8% | 7.5% | 0.5% | -- | 100% |
| 2012 | 55.6% | 18.5% | 17.8% | 7.5% | 0.5% | -- | 100% |
| 2013 | 55.7% | 17.9% | 18.4% | 7.7% | 0.2% | -- | 100% |
| 2014 | 54.8% | 15.9% | 20.7% | 8.6% | 0.0% | -- | 100% |
| 2015 | 53.4% | 15.8% | 22.6% | 8.2% | 0.0% | -- | 100% |
| 2006-2015 Avg. | 53.6% | 18.4% | 17.8% | 8.0% | 2.2% | -- | -- |

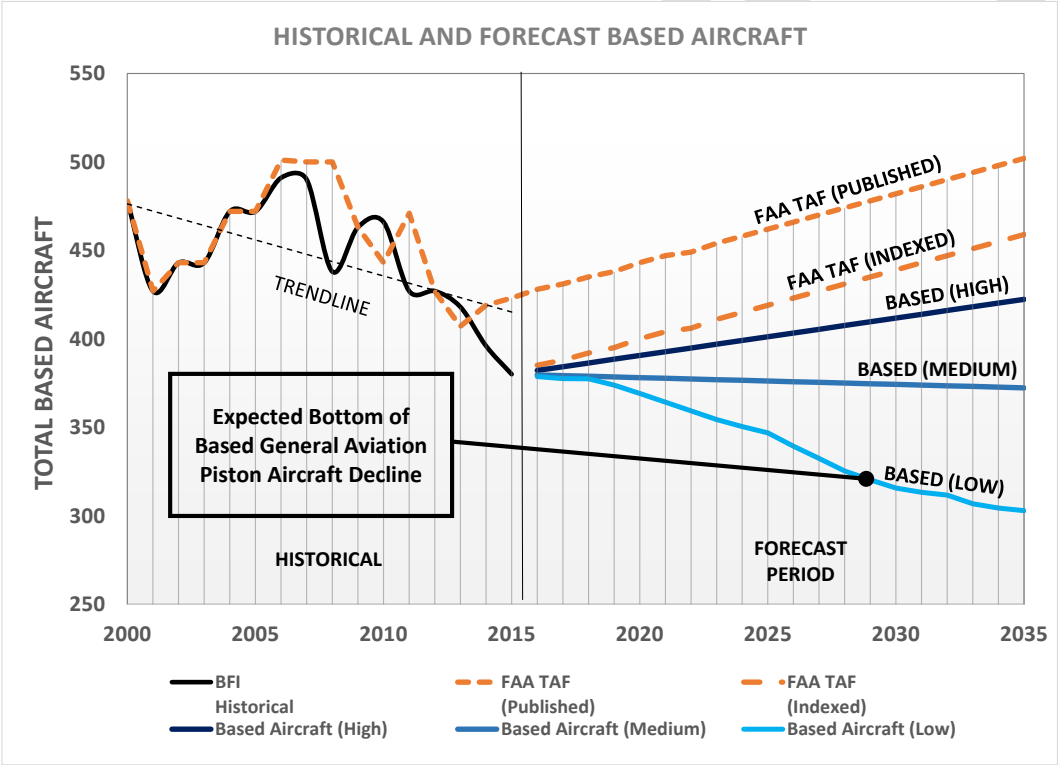
***SOURCE**: BFI Airport Records.*

**Figure B7** graphs the historical based aircraft, the FAA TAF forecast (actual and indexed to 2015 based aircraft levels) along with the preliminary range of low, medium, and high MP Update forecasts. The FAA TAF based aircraft projection, which is projected using a basic high-level analysis, results in a high forecast level as a consequence of using a high based aircraft count starting in 2015 (423 versus the actual 380 based aircraft). For this reason, the FAA TAF has been indexed downward to reflect the actual 380 based aircraft. Based aircraft were projected using several BFI historic trend methods combined with FAA industry forecast growth rates by major aircraft type (see **Table B14**). The low forecast reflects a continued loss of piston based aircraft. The growth forecast scenarios reflect a slowing decline of piston based aircraft, coupled with a

greater proportion of business-corporate general aviation utilization increases, including the potential influx of new high-end service operator tenants at BFI.

**Preferred Based Aircraft Forecast.** The preferred based aircraft forecast was derived from a bottom-up approach, by applying FAA Aerospace general aviation forecast rates to each of the major aircraft types (single piston, twin piston, turboprop, business jet, helicopter) based at BFI in 2014 and 2015. In addition, general aviation aircraft production publications were referenced to provide a more detailed understanding of delivery trends for particular aircraft models; such as the small, medium, and large cabin business jets, and piston versus turbine helicopter production. The preferred forecast method generates a slight net decline in based aircraft, as evident of the past 10 years of piston aircraft trends, which is a reasonable expectation for BFI, at least in the near-term 5 to 10 year forecast horizon. The preferred forecast results in 372 based aircraft by 2035, a net decline of 8 aircraft, which equates to an average annual rate of 0.16 percent. The piston fleet is projected to decline -1.2%, the turboprop fleet increase 0.5%, and the business jet increase 2.0% annually.

Figure B7 **BASED AIRCRAFT TRENDS AND FORECAST PROJECTION SCENARIOS**




***SOURCE:*** Trend - BFI Airport Records | Forecast – Consultant Forecast (April, 2016)

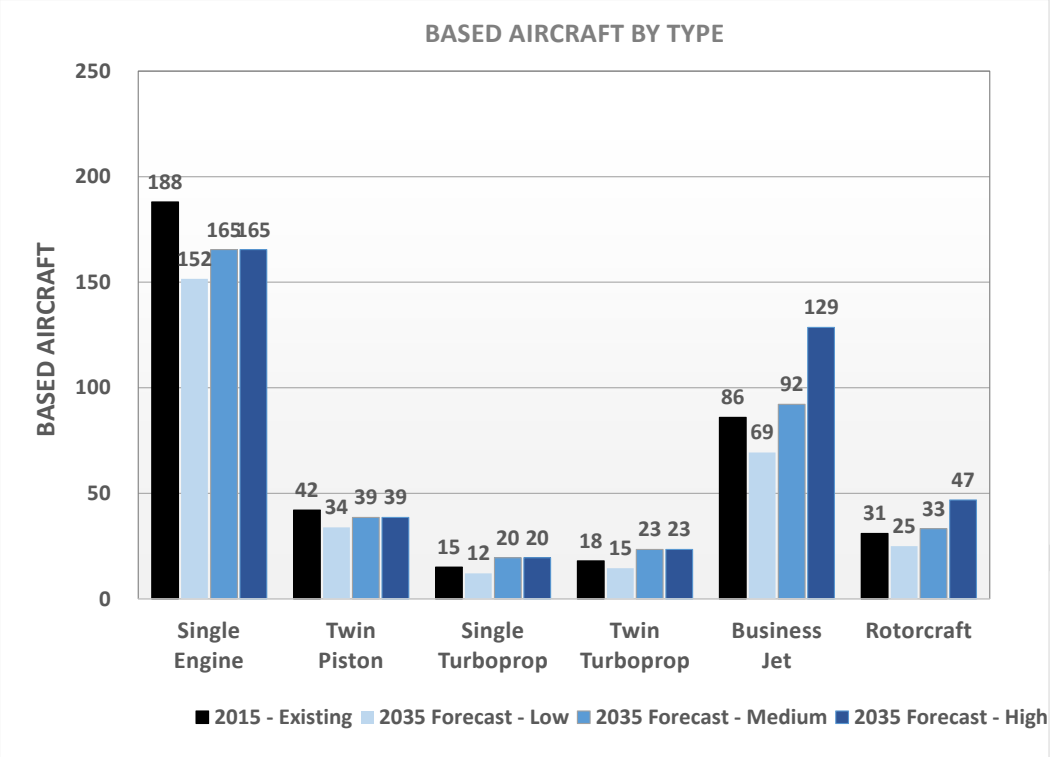
Table B14 **BFI BASED AIRCRAFT HISTORICAL AND FORECAST SCENARIOS (2000 TO 2035)**

| Year | FAA TAF (Published) | FAA TAF (Indexed) | MP Update Forecasts | | |
|---|---|---|---|---|---|
| | | | Based Aircraft (High) | Based Aircraft (Medium) | Based Aircraft (Low) |
| 2000 | 478 | 478 | 478 | 478 | 478 |
| 2001 | 427 | 427 | 427 | 427 | 427 |
| 2002 | 443 | 443 | 443 | 443 | 443 |
| 2003 | 443 | 443 | 443 | 443 | 443 |
| 2004 | 472 | 472 | 472 | 472 | 472 |
| 2005 | 472 | 472 | 472 | 472 | 472 |
| 2006 | 501 | 501 | 491 | 491 | 491 |
| 2007 | 500 | 500 | 490 | 490 | 490 |
| 2008 | 500 | 500 | 438 | 438 | 438 |
| 2009 | 463 | 463 | 463 | 463 | 463 |
| 2010 | 443 | 443 | 466 | 466 | 466 |
| 2011 | 471 | 471 | 427 | 427 | 427 |
| 2012 | 427 | 427 | 427 | 427 | 427 |
| 2013 | 407 | 407 | 418 | 418 | 418 |
| 2014 | 419 | 419 | 396 | 396 | 396 |
| 2015 | 423 | 423 | 380 | 380 | 380 |
| **2020** | **443** | **400** | **391** | **378** | **369** |
| **2025** | **462** | **419** | **401** | **376** | **347** |
| **2030** | **482** | **439** | **412** | **374** | **316** |
| **2035** | **502** | **459** | **422** | **372** | **303** |
| % CAGR | 0.9% | 0.4% | 0.5% | -0.1% | -1.1% |

***Note:*** *Dark box indicates recommended forecast scenario.*
***SOURCE****: Historical: FAA and BFI Based Aircraft Records*
***SOURCE****: Forecast: Consultant Forecast (2015 to 2035), Conducted April, 2016*

**Figure B8** depicts the forecast of based aircraft by aircraft user group. The forecasts continue to show a decline in piston aircraft, as marginal increase in turboprop, and a moderate increase in business jet and helicopter. It is anticipated the based piston fleet will bottom-out around 150 to 165 based aircraft. The based turbine aircraft segment is expected to increase due to an increasing demand and concentration of business-class aircraft being able to provide close access to the core downtown Seattle metropolitan district.

Figure B8 **BASED AIRCRAFT TYPES BY FORECAST PROJECTION SCENARIOS**




***SOURCE**: Consultant Based Aircraft Forecast Scenarios (2016 to 2035), Conducted April, 2016*

## Summary

It is anticipated that BFI will see some growth in most activity areas during the 20-year planning period. By 2035, approximately 39,000 enplanements and nearly 171,000 operations are projected to occur. Continued declines are anticipated in in both operations and based aircraft related to the recreational/training sector of general aviation, which are projected to be offset by steady and continued growth of the business/corporate general aviation sector. **Table 15** entitled *SUMMARY OF AVIATION ACTIVITY FORECASTS 2015-2035* summarizes the projections contained in this chapter.

Table B15 **SUMMARY OF AVIATION ACTIVITY FORECASTS 2015-2035**

| | 2015 | 2020 | 2025 | 2030 | 2035 | CAGR 2015-2035 |
|---|---|---|---|---|---|---|
| **Passenger Enplanements** | **20,214** | **23,852** | **28,144** | **33,209** | **39,186** | **3.37%** |
| Scheduled (Kenmore Air) | 10,817 | 12,555 | 14,567 | 16,896 | 19,593 | 3.10% |
| Non-Scheduled | 9,397 | 11,297 | 13,578 | 16,313 | 19,593 | 3.74% |
| **Operations** | | | | | | |
| ***Commercial Service*** | ***7,844*** | ***9,174*** | ***10,638*** | ***11,293*** | ***11,297*** | ***2.15%*** |
| Scheduled (Kenmore Air) | 1,821 | 1,942 | 2,072 | 2,210 | 2,358 | 1.3% |
| Non-Scheduled | 1,825 | 2,035 | 2,269 | 2,529 | 2,820 | 2.3% |
| Boeing | 4,198 | 5,197 | 6,297 | 6,553 | 6,819 | 2.46% |
| ***Air Cargo*** | ***12,336*** | ***12,965*** | ***13,627*** | ***14,322*** | ***15,052*** | ***1.0%*** |
| ***General Aviation*** | ***143,783*** | ***135,430*** | ***127,151*** | ***134,394*** | ***142,039*** | ***-0.06%*** |
| Air Taxi | 20,503 | 21,927 | 23,470 | 25,110 | 26,866 | 1.36% |
| Corporate | 26,404 | 30,403 | 35,099 | 40,312 | 46,418 | 2.86% |
| Recreational/Training | 96,876 | 83,090 | 68,672 | 68,672 | 68,755 | -1.7% |
| ***Military*** | ***1,608*** | ***1,669*** | ***1,733*** | ***1,799*** | ***1,867*** | ***0.75%*** |
| **Total Operations** | **165,571** | **159,239** | **153,148** | **161,807** | **170,956** | **0.2%** |
| **Based Aircraft** | **380** | **378** | **376** | **374** | **372** | **-0.1%** |
| **Air Cargo** (Enplaned & Deplaned in tons) | 268,741 | 288,391 | 308,041 | 327,692 | 347,342 | **1.29%** |

***SOURCE**: Forecast: Consultant Forecast (2015 to 2035), Conducted April, 2016*

## Runway Design Code (RDC)/Critical Aircraft Analysis

Knowledge of the types of aircraft currently using, and those that are expected to use BFI offers insight on the designation of the appropriate Runway Design Code (RDC) for each runway. FAA Advisory Circular 150/5300-13A, Change 1, *Airport Design*, provides guidance for this determination. The RDC is based on the "Design Aircraft" that is determined to be the most critical aircraft, or group of aircraft, using or projected to use a runway on a regular basis. A number of FAA guidance documents define regular basis as 500 or more annual operations (landing and takeoffs are considered as separate operations). It is important to note that the 500 annual operations "substantial use" threshold is not a cap or limit on aircraft operations, but rather a planning metric for consideration of the potential need to upgrade airport facilities to a particular design standard. The identified design aircraft can either be one aircraft, or a composite of more than one aircraft, representing the highest Aircraft Approach Category (AAC) and Airplane Design Group (ADG).

The selected AAC and ADG are then combined to represent the Runway Design Code (RDC) of a particular runway, and the RDC determines the dimensional criteria standards that are applicable to that runway. The first component (i.e., the AAC) is depicted by a letter and relates to the aircraft approach speed. The second component (i.e., the ADG), is depicted by a roman numeral and relates to the aircraft wingspan and tail height. The third component relates to the visibility minimums for the runway, defined as RVR values in measurements of feet at 1,200, 1,600, 2,400, 4,000, and 5,000 (corresponding to lower than ¼ mile, lower than ½ mile but not lower than ¼ mile, lower than ¾ mile but not lower than ½ mile, lower than 1 mile but not lower than ¾ mile, and not lower than 1 mile respectively). The AAC, ADG, and Visibility Minimums are presented in the following tables entitled *AIRCRAFT APPORACH CATEGORY (AAC)*, *AIRPLANE DESIGN GROUP (ADG)* and *VISIBILITY MINIMUMS*.

Table B16 **AIRCRAFT APPROACH CATEGORY (AAC)**

| AAC | $V_{Ref}$/Approach Speed |
|---|---|
| A | Approach speed less than 91 knots |
| B | Approach speed 91 knots or more but less than 121 knots |
| C | Approach speed 121 knots or more but less than 141 knots |
| D | Approach speed 141 knots or more but less than 166 knots |
| E | Approach speed 166 knots or more |

***SOURCE:*** *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014*

Table B17 **AIRPLANE DESIGN GROUP (ADG)**

| ADG | Tail Height | Wing Span |
|---|---|---|
| I | Less than 20 Feet | Less than 49 Feet |
| II | Greater than 20, but less than 30 Feet | Greater than 49, but less than 79 Feet |
| III | Greater than 30, but less than 45 Feet | Greater than 79, but less than 118 Feet |
| IV | Greater than 45, but less than 60 Feet | Greater than 118, but less than 171 Feet |
| V | Greater than 60, but less than 66 Feet | Greater than 171, but less than 214 Feet |
| VI | Greater than 66, but less than 80 Feet | Greater than 214, but less than 262 Feet |

***SOURCE:*** *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014*

Table B18 **VISIBILITY MINIMUMS**

| RVR (ft) | Instrument Flight Visibility Category (statute miles) |
|---|---|
| VIS | Visual Approach |
| 5000 | Not lower than 1 mile |
| 4000 | Lower than 1 mile but not lower than ¾ mile |
| 2400 | Lower than ¾ mile but not lower than ½ mile |
| 1600 | Lower than ½ mile but not lower than ¼ mile |
| 1200 | Lower than ¼ mile |

***SOURCE:*** *FAA AC 150/5300-13A, Airport Design, Change 1, February 2014*

## Runways

**Runway 13R/31L (Primary).** According to operational data that was collected in part from BFI using the Passur Aerospace data tool and information provided by BFI Operations Staff, the Airport's primary runway (Runway 13R/31L), has a RDC of D-IV, with the most critical aircraft being a combination of commercial service jets. The design aircraft for Runway 13R/31L is various models of the Boeing 767 (200 and 300 series). Each of the aircraft has an ADG of IV and an AAC of C & D. The operations per each aircraft are depicted in **Table B19** entitled, *RUNWAY 13R/31L CRITICAL AIRCRAFT OPERATIONS, 2015.*

Table B19 **RUNWAY 13R/31L CRITICAL AIRCRAFT OPERATIONS, 2015**

| Aircraft | Operations |
|---|---|
| Boeing 767 (All Models) | 4,200 |
| Boeing 767-300 ER & ERW | 2,666 |
| **Total** | **4,200** |

***SOURCE:*** *BFI Passur Data estimates & Airport Staff.*

**Runway 13R/31L (Secondary).** The Airport's secondary parallel runway (Runway 13L/31R) has a RDC of B-I (Small Aircraft Only), with the most critical aircraft being a combination of various small general aviation aircraft (e.g., the Piper Navajo PA, Cessna's 172 Skyhawk and 182 Skylane, and the Cirrus SR 22). These aircraft have an ADG of I and an AAC of A & B. The estimated operations for each aircraft are depicted in the **Table B20** entitled, *RUNWAY 13L/31R CRITICAL AIRCRAFT OPERATIONS, 2015.*

Table B20 **RUNWAY 13L/31R CRITICAL AIRCRAFT OPERATIONS, 2015**

| Aircraft | Operations |
|---|---|
| Piper Navajo PA | 5,502 |
| Cessna 172 Skyhawk | 10,599 |
| Cessna 182 Skylane | 9,652 |
| Cirrus SR 22 | 1,561 |
| **Total** | 27,314 |

***SOURCE:*** *BFI Passur Data estimates.*

Aircraft depicting the various RDCs at BFI are presented in **Table B9** entitled *REPRESENTATIVE AIRCRAFT BY RUNWAY DESIGN CODE (RDC)*.

## Forecast Approval

In accordance with language specified in Aviation Forecast Guidance APP-400, local aviation forecasts are approved by regional airports division offices or airports district offices (ADOs). Local forecasts that are consistent with the FAA's Terminal Area Forecast (i.e., the local forecast differs by less than 10% in the first five years, differs by less than 15% in the remaining forecast periods, and does not affect the timing or scale of an airport project) do not need to be coordinated with APP-400 and APO-110. Local forecasts that are not consistent with the TAF, but which do not affect the timing or scale of an airport project and do not impact the analysis of a National Environmental Policy Act (NEPA) document or Benefit Cost Analysis (BCA), may be accepted (not approved) for information purposes by the regional office/ADO without APP/APO coordination.

**Tables B21 & B22** present the FAA TAF forecast comparison summary, in which all MP Update forecast components are below the 2015 FAA TAF activity forecast levels, or otherwise within the specified TAF thresholds for FAA acceptance.

## Runway 13R/31L

ARC C/D-IV: **LARGE COMMERCIAL JET**

> ***Boeing 767-200 & 300***
> **Boeing 757-200**
> **Airbus A-300**
> **Boeing MD-11**


## Runway 13L/31R

RDC A/B-I: **Small General Aviation: ≥ 12,500 lbs.**

> ***Piper Navajo PA***
> **Cessna 172 Skyhawk**
> **Cessna 182 Skylane**
> **Cirrus SR 22**

Representative Aircraft not to scale.



FIGURE B9 **Representative Aircraft by Runway Design Code (RDC)**

Table B21 **FAA TAF FORECAST COMPARISON, 2015-2030**

| Forecast Component | Year | Airport Forecast | FAA TAF | AF/TAF (% Difference) |
|---|---|---|---|---|
| **Passenger Enplanements**[1] | | | | |
| Base yr. | 2015 | 20,214 | 25,301 | -20.1% |
| Base yr. + 5yrs. | 2020 | 23,852 | 29,464 | -19.0% |
| Base yr. + 10yrs. | 2025 | 28,144 | 34,323 | -18.0% |
| Base yr. + 15yrs. | 2030 | 33,209 | 39,991 | -17.0% |
| **Commercial Operations**[1, 2] | | | | |
| Base yr. | 2015 | 40,683 | 40,072 | 1.5% |
| Base yr. + 5yrs. | 2020 | 41,341 | 43,909 | -5.8% |
| Base yr. + 10yrs. | 2025 | 47,634 | 48,127 | -1.0% |
| Base yr. + 15yrs. | 2030 | 50,558 | 52,753 | -4.2% |
| **Total Operations** | | | | |
| Base yr. | 2015 | 165,571 | 170,950 | -3.1% |
| Base yr. + 5yrs. | 2020 | 160,623 | 172,163 | -6.7% |
| Base yr. + 10yrs. | 2025 | 153,148 | 178,722 | -14.3% |
| Base yr. + 15yrs. | 2030 | 161,807 | 185,733 | -12.9% |

***SOURCE**: Forecast: Consultant Forecast (2016 to 2035), Conducted April, 2016*

***Notes:*** Red denotes a MP Update value less than the FAA *TAF*
TAF data is based on the U.S. Government fiscal year basis (October through September).

[1] Since more recent data is available than reported in the TAF, the TAF growth rates have been applied to 2015 actual enplanement and operations data.

[2] TAF projections of commercial operations include air cargo operations and some general aviation air taxi operations. The airport forecasts include only operations on commercial service airlines. For the purpose of this MP Update, air cargo operations have been developed separately and air taxi operation have been included in general aviation operations projections.

Table B22 **FAA TAF - AIRPORT PLANNING FORECAST SUMMARY**

| Forecast Component | Base Yr. Level 2015 | Base Yr. + 1yr. 2016 | Base Yr. + 5yrs. 2020 | Base Yr. + 10yrs. 2025 | Base Yr. + 15yrs. 2030 | Base Yr. + 15yrs. 2030 |
|---|---|---|---|---|---|---|
| **Passenger Enplanements**[1] | **20,214** | **20,894** | **23,852** | **28,144** | **33,209** | **3.4%** |
| Air Carrier (Non-Scheduled) | 9,397 | 9,750 | 11,297 | 13,578 | 16,313 | 3.7% |
| Commuter (Scheduled) | 10,817 | 11,145 | 12,555 | 14,567 | 16,896 | 3.0% |
| | | | | | | |
| **Annual Aircraft Operations**[1, 2] | **165,571** | **160,623** | **159,239** | **153,148** | **161,807** | **-0.2%** |
| **Itinerant** | **129,648** | **126,007** | **125,341** | **121,256** | **128,112** | **-0.1%** |
| Air Carrier | 3,646 | 3,710 | 3,977 | 4,341 | 4,740 | 1.8% |
| Commuter/Air Taxi | 16,534 | 16,857 | 18,162 | 19,924 | 20,875 | 1.6% |
| Total Commercial | **20,180** | **20,567** | **22,140** | **24,264** | **25,614** | **1.6%** |
| General Aviation | 108,503 | 104,468 | 102,200 | 95,952 | 101,418 | -0.4% |
| Military | 965 | 972 | 1,002 | 1,040 | 1,079 | 0.8% |
| **Local** | **35,923** | **34,616** | **33,898** | **31,892** | **33,696** | **-0.4%** |
| General Aviation | 35,280 | 33,968 | 33,230 | 31,199 | 32,976 | -0.4% |
| Military | 643 | 648 | 668 | 693 | 719 | 0.8% |
| | | | | | | |
| **Instrument Operations** | 58,088 | 56,352 | 55,866 | 53,730 | 56,768 | -0.2% |
| **Peak Hour Operations** | 93 | 90 | 86 | 91 | 96 | 0.2% |
| **Cargo/Mail (Enp+Dep Tons)** | 268,741 | 272,671 | 288,391 | 308,041 | 327,692 | 1.3% |
| | | | | | | |

***SOURCE**: Forecast: Consultant Forecast (2016 to 2035), Conducted April, 2016*

***Notes:*** Red denotes a MP Update value less than the FAA *TAF*

TAF data is based on the U.S. Government fiscal year basis (October through September).

[1] Since more recent data is available than reported in the TAF, the TAF growth rates have been applied to 2015 actual enplanement and operations data.

[2] TAF projections of commercial operations include air cargo operations and some general aviation air taxi operations. The airport forecasts include only operations on commercial service airlines. For the purpose of this MP Update, air cargo operations have been developed separately and air taxi operation have been included in general aviation operations projections.

Table B22 **FAA TAF - AIRPORT PLANNING FORECAST SUMMARY** (CONTINUED)

| Forecast Component | Base Yr. Level 2015 | Base Yr. + 1yr. 2016 | Base Yr. + 5yrs. 2020 | Base Yr. + 10yrs. 2025 | Base Yr. + 15yrs. 2030 | Base Yr. + 15yrs. 2030 |
|---|---|---|---|---|---|---|
| **Based Aircraft (Rounded)** | **380** | **379** | **379** | **377** | **375** | **-0.1%** |
| Single Engine (Non-Jet) | 203 | 202 | 198 | 194 | 189 | -0.5% |
| Multi Engine (Non-Jet) | 60 | 60 | 61 | 62 | 62 | 0.2% |
| Jet | 86 | 86 | 88 | 89 | 91 | 0.4% |
| Helicopter | 31 | 31 | 32 | 32 | 33 | 0.4% |
| Other | N/A | N/A | N/A | N/A | N/A | N/A |
| **Average Aircraft Size (seats)** | | | | | | |
| Air Carrier | 125.0 | 127.0 | 130.0 | 132.0 | 135.0 | -- |
| Commuter | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | -- |
| **Avg. Enplaning Load Factor** | | | | | | |
| Air Carrier | 60.0% | 60.0% | 60.0% | 60.0% | 60.0% | -- |
| Commuter | 45.0% | 48.0% | 50.0% | 50.0% | 50.0% | -- |
| **GA Ops Per Based Aircraft** | 436 | 424 | 420 | 406 | 431 | -- |

***SOURCE**: Forecast: Consultant Forecast (2016 to 2035), Conducted April, 2016*

***Notes:*** Red denotes a MP Update value less than the FAA *TAF*

TAF data is based on the U.S. Government fiscal year basis (October through September).

[1] Since more recent data is available than reported in the TAF, the TAF growth rates have been applied to 2015 actual enplanement and operations data.

[2] TAF projections of commercial operations include air cargo operations and some general aviation air taxi operations. The airport forecasts include only operations on commercial service airlines. For the purpose of this MP Update, air cargo operations have been developed separately and air taxi operation have been included in general aviation operations projections.

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