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Seattle-Area Metroplex (SAMP) Environmental Impact Statement
Aircraft Seat Capacity Estimates and Fleet Upgauging

A Technical Comment of SAMP SEPA Seat Growth Assumptions and Their Implications for Operations, Passenger Throughput, and Community Noise Effects

Executive Summary

The Seattle-Tacoma International Airport Master Plan (SAMP) projects 56 million annual enplanements by 2032 while assuming average seats per departure grow at only 0.5 percent per year — from approximately 141 seats in 2023 to 148 seats by 2032. This analysis demonstrates that assumption is increasingly inconsistent with announced airline fleet strategies and, more critically, is arithmetically incompatible with the SAMP's own passenger target at any realistic load factor. Under the SAMP's 0.5 percent seat growth assumption, meeting the 56 million enplanement target would require approximately 880,000 total annual operations — more than 1.7 times the current updated infrastructure ceiling of approximately 517,000 operations documented in the Technical Appendix to the SEA Airport Capacity Analysis (Bogen, 2026). The only operationally viable path to 56 million enplanements within the airport's constrained operations ceiling is materially faster upgauging — making the moderate (2 percent) or high (3.5 percent) scenario not a stress case but a prerequisite for the plan's internal consistency.

1. Background

The SAMP forecast incorporates a fleet mix assumption expressed as average seats per departure. This metric is the critical bridge between the passenger demand forecast and the operations count — and therefore between the SAMP's passenger targets and the physical throughput constraints of the airfield.

This comment examines whether the seat growth rate assumed in the SAMP remains defensible in light of material airline fleet decisions made after the SAMP's baseline was established.

2. Airline Fleet Developments — Post-SAMP Baseline

Alaska Airlines — Structural Fleet Change

The SAMP correctly noted that Alaska Airlines lacked a substantial widebody fleet at the time of its analysis. That assessment has materially shifted since the baseline was set.

In January 2026, Alaska announced the largest fleet order in the airline's history: 105 Boeing 737-10 aircraft and five new Boeing 787 widebody jets, with its firm future 787 fleet growing to 17 aircraft. The Boeing 737-10 is the longest-range, highest-capacity variant in the 737 MAX family, with a typical two-class configuration of approximately 176–188 seats compared to 150–162 seats on the 737-800 that it replaces across Alaska's domestic network. That replacement cycle alone could contribute 15 to 20 additional seats per departure on domestic routes without the addition of a single widebody rotation — making even the moderate seat growth scenario conservative on a standalone basis.

Alaska is explicitly targeting at least 12 long-haul international destinations from Seattle with widebody aircraft by 2030 and has already launched daily nonstop service to Tokyo Narita — described by the airline as the beginning of "a new era of widebody international flying" from Seattle. Alaska has articulated a strategic goal of transforming Seattle into the West Coast's premier global gateway, noting that SEA is geographically the closest connection between the continental United States and Tokyo — approximately 7 percent closer than San Francisco and 13 percent closer than Los Angeles.

This represents a structural change in Alaska's fleet composition and strategic positioning at SEA, not a marginal or incremental adjustment.

Delta Air Lines — Sustained Infrastructure Commitment at SEA

The SAMP acknowledged that Delta had capacity to upgauge its SEA operations. Delta's subsequent actions at the airport have been aggressive and long-term in character.

Delta has secured a long-term lease giving it priority access to 18 gates across Concourses A and B and has completed a new Delta One Lounge and a renovated Sky Club — representing a durable infrastructure commitment, not opportunistic capacity deployment. Delta is adding transatlantic service to Rome and Barcelona using Airbus A330-900 widebody aircraft, expanding its transatlantic portfolio at SEA to five destinations alongside existing Amsterdam, Paris, and London Heathrow service. Delta's

broader "pivot to the Pacific" strategy includes year-round nonstop service between Seattle and Taipei, adding another long-haul widebody rotation to the SEA international portfolio.

In early 2026, Delta placed a major order for up to 60 Boeing 787-10 Dreamliner aircraft to support long-haul international growth and fleet modernization. An expanded widebody fleet at the system level increases the probability that additional widebody rotations will be assigned to high-yield markets such as SEA.

Technical Note — Aircraft Type Verification

The A330-900neo has a range of approximately 7,200 nautical miles (13,334 km), which comfortably covers both Rome (~5,100 nm from SEA) and Barcelona (~5,400 nm from SEA). The aircraft type cited is consistent with route requirements.

3. Updated Seat Capacity Scenarios

3.1 Revised Fleet Mix Basis

Using the updated SEA fleet mix trajectory described above, three seat growth scenarios can be constructed as alternatives to the SAMP's 0.5 percent baseline assumption. These scenarios reflect different rates of fleet evolution and are summarized in the table below.

Table 1. SAMP vs. Revised Seat Capacity Scenarios — Projected to 2032

Scenario	Seat Growth Rate	Est. Seats / Departure (2032)	Ops Required for 56M Enplanements (86% LF)	Assessment
SAMP Baseline	0.5% per year	~148	~880,000	Exceeds updated infrastructure ceiling (~517K ops) by ~1.7×; internally inconsistent with passenger target at any realistic load factor
Moderate	2.0% per year	~168	~774,000	Substantially reduces the operations gap; 56M enplanements more plausible at the constrained ceiling with concurrent gate and runway investment

Scenario	Seat Growth Rate	Est. Seats / Departure (2032)	Ops Required for 56M Enplanements (86% LF)	Assessment
High	3.5% per year	~187	~695,000	Best operational fit; supports 56M+ enplanements with greatest headroom under the infrastructure ceiling; consistent with full Alaska 787 hub buildout and continued Delta Pacific pivot

Operations Arithmetic

The formula applied throughout Table 1 is:

Required Total Operations = (Enplanements ÷ (Seats × Load Factor)) × 2

At 86% load factor and 148 seats: (56,000,000 ÷ (148×0.86)) × 2

≈ 880,000 total operations.

3.2 Scenario Interpretation

SAMP Baseline (0.5%): The SAMP's assumption yields only 7 additional seats per departure over nine years — from approximately 141 in 2023 to 148 by 2032. This rate of change is inconsistent with the announced fleet trajectories of the two dominant carriers at SEA. More significantly, it is arithmetically incompatible with the SAMP's own 56 million enplanement target at any realistic load factor, as demonstrated in Section 4 below.

Moderate Scenario (2.0%): A 2 percent annual seat growth rate reaches approximately 168 seats per departure by 2032 — a 27-seat gain that is broadly consistent with the combined effect of Alaska's 737-10 domestic fleet replacement and the addition of 10 to 12 widebody international routes. This scenario represents the most defensible central estimate given publicly announced airline commitments.

High Scenario (3.5%): A 3.5 percent annual growth rate would bring the average departure to approximately 187 seats — indicative of a fleet composition trending toward a mid-tier widebody-weighted hub. This is ambitious but not implausible if Alaska fully executes its 12-route international strategy and Delta continues its Pacific expansion with additional A350 and 787 widebody deployments.

One important distinction: average seats per departure can increase through two independent mechanisms — more widebody aircraft on international routes (high seat count, lower frequency) or

larger narrowbodies on domestic routes (moderate seat count gain, high frequency). The 737-10 replacement cycle addresses the second mechanism and could contribute a meaningful seat-per-departure increase without any additional widebody operations. This makes even the moderate scenario potentially conservative.

4. The Operations Arithmetic — Where the SAMP Assumptions Break Down

SEA recorded 435,896 total operations in 2025 and accommodated approximately 52.72 million enplanements — placing the airport at roughly 97 percent of the current updated operations ceiling (approximately 449,000 operations, or the constrained peak achievable at current infrastructure levels when measured against the 2019 practical maximum of 450,487 operations).

Technical Note — Operations Ceiling Distinction

The 2019 actual peak of 450,487 operations represents the highest observed throughput at SEA under the pre-TBFM, pre-Reduced Diagonal Spacing operational environment. The Technical Appendix to the SEA Airport Capacity Analysis (Bogen, 2026) documents that TBFM deployment and Reduced Diagonal Spacing have increased the constrained infrastructure ceiling to approximately 517,000 annual operations under current operational procedures. References in this document to the "practical ceiling" reflect the 2019 historical peak as a conservative bound; the updated ceiling of ~517,000 is the more appropriate planning reference for forward-looking scenarios. Both figures materially exceed the ~880,000 operations the SAMP's baseline assumption would require, reinforcing rather than mitigating the fundamental inconsistency.

The critical arithmetic is as follows. If SEA accommodates 56 million enplanements by 2032, at an industry-standard load factor of 86 percent and the SAMP's assumed 148 seats per departure, the required number of departures is approximately 440,000 — yielding approximately 880,000 total operations (arrivals plus departures). That figure is approximately 1.7 times the updated infrastructure

ceiling of 517,000 annual operations. Even incorporating connecting passengers — who reduce the effective enplanements-per-departure ratio — the numbers remain irreconcilable at any load factor above approximately 47 percent, far below any realistic operational standard.

The SAMP cannot simultaneously maintain a conservative seat growth assumption of 0.5 percent per year and a 56 million enplanement target. These two parameters are arithmetically incompatible under the physical throughput constraints of the existing airfield. The only internally consistent resolution is faster upgauging — which means the moderate or high scenario is not a planning stress case but an operational prerequisite for the SAMP's own goals to be achievable.

Looking further ahead, how Seattle-Tacoma International Airport would accommodate 70 million or more enplanements in the years beyond 2032 — without infrastructure improvements that substantially expand runway throughput — remains an unresolved planning question that warrants direct treatment in the SAMP.

5. What Makes the 56 Million Enplanement Target Achievable

The SAMP near-term projects are specifically designed to accommodate 56 million enplanements and meet forecasted demand to 2032. The principal infrastructure investment — a second terminal with 19 new gates in approximately 575,000 square feet — addresses terminal throughput and gate capacity, not runway operations. More gates enable larger aircraft to be handled more efficiently and flexibly, which is an implicit operational endorsement of upgauging — but it is not a validation of the 0.5 percent seat growth assumption. Terminal expansion and fleet upgauging are complementary and mutually reinforcing; the SAMP's infrastructure investment implicitly assumes the latter while its modeling conservatively understates it.

The conclusion is that the SAMP's passenger target and its seat growth assumption are in tension. The only operationally viable path to 56 million enplanements within the airport's constrained operations ceiling is materially faster upgauging — which confirms that the moderate or high seat growth scenario is a planning prerequisite, not a sensitivity case.

6. Implications for Community Noise

For aviation noise-affected communities surrounding Seattle-Tacoma International Airport, the fleet upgauging trajectory documented in this comment has significant practical implications that are not adequately addressed in the SAMP.

Larger aircraft — including the Boeing 737-10, Boeing 787, and Airbus A330-900 — produce greater absolute acoustic energy per operation than the smaller narrowbody and regional jet aircraft they replace. While the FAA's Day-Night Average Sound Level (DNL) metric averages noise exposure over a 24-hour period and applies a 10-decibel nighttime penalty, this metric does not fully capture the low-frequency noise components that are characteristic of larger turbofan engines and that have been associated with community annoyance and health effects at exposure levels below the 65 DNL threshold. Because DNL calculations weight and roll off low-frequency energy, an increase in widebody and high-capacity narrowbody operations may not produce a measurable change in the official 65 DNL contour — even as the actual low-frequency acoustic environment experienced by nearby residents deteriorates year over year.

This dynamic is well recognized by aviation noise researchers and public health organizations internationally, even if it is not yet reflected in U.S. regulatory standards. The absence of a regulatory threshold does not mean the absence of an impact.

This analysis should be explicitly acknowledged and transparently communicated in the SAMP, regardless of current regulatory requirements. The Port of Seattle has an opportunity to lead on this issue — to proactively advocate for the health and well-being of aircraft noise-affected surrounding communities rather than waiting for national noise and health regulations to address what is already a recognized and growing concern. The appropriate time for additional noise mitigation advocacy is now, not upon some future regulatory trigger.

7. Conclusions and Recommended SAMP Revisions

Based on the analysis above, the following revisions to the SAMP are recommended:

1. **Fleet Mix Assumption:** The SAMP should update its seat growth assumption from 0.5 percent per year to a range reflecting the moderate scenario (2.0 percent) as the central estimate, with the high scenario (3.5 percent) as an upper bound. This adjustment should be applied consistently across all passenger-to-operations translations in the SAMP and EIS.
2. **Internal Consistency Check:** The SAMP should demonstrate arithmetic consistency between its enplanement forecast, seat growth assumption, load factor assumption, and operations count in

a single integrated table. The current baseline assumptions are not mutually consistent at the stated passenger target.

3. **Operations Ceiling Reference:** The SAMP should reference the updated infrastructure-constrained operations ceiling of approximately 517,000 annual operations (reflecting TBFM deployment and Reduced Diagonal Spacing improvements) rather than the 2019 historical peak of 450,487 operations as the relevant planning bound.
4. **Noise Disclosure:** The SAMP and EIS should include a dedicated discussion of low-frequency noise impacts associated with fleet upgauging, acknowledging the limitations of the DNL 65 metric in capturing this dimension of community impact and identifying opportunities for the Port of Seattle to pursue proactive noise mitigation measures.

References and Data Sources

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