

Seattle-Area Metroplex (SAMP) Environmental Impact Statement

Noise Analysis Deficiency — Inadequate Metric and Health Impact Assessment

I. Summary of Objection

The SEPA Draft Environmental Impact Statement's noise analysis is legally insufficient under WAC 197-11-794. By importing the FAA's 1.5 dB/65 DNL significance threshold wholesale from the federal NEPA process, the Port has substituted a federal regulatory shorthand for Washington's own multi-factor significance standard — which the regulation explicitly prohibits. The result is that the DEIS fails to disclose, analyze, or mitigate impacts that are real, documentable, and directly tied to the Project's increase in aircraft operations.

By 2037, the Proposed Action will add approximately 35,000 annual aircraft operations above the No Action Alternative — roughly 96 additional flights per day. These additional events generate no fewer noise disruptions per resident; they simply average into a DNL figure that does not cross the federal threshold. WAC 197-11-794 requires this Port to assess magnitude, population affected, and reversibility of impacts — not merely whether a single federal metric moves 1.5 dB.

II. Legal Standard — WAC 197-11-794

WAC 197-11-794 establishes Washington's test for significance. It directs agencies to consider context and intensity, including:

- The magnitude of the impact
- The number of people or amount of environment affected
- The probability of the impact occurring
- Whether the effects are reversible or irreversible

Critically, WAC 197-11-794(3) states that agencies should not establish numerical thresholds below which impacts are never significant. Significance is a qualitative judgment made in light of all relevant factors — it is not a mechanical trigger.

The DEIS violates this standard by reasoning as follows: "Noise would not increase above levels that FAA considers significant." SEPA does not ask what the FAA considers significant. It asks what Washington's multi-factor analysis finds. The DEIS never conducts that analysis for the noise resource. Every factor in WAC 197-11-794 — magnitude, population, reversibility — is left unanswered because the analysis stops at the federal threshold.

III. The DNL Metric Cannot Answer Washington’s Significance Test

The Day-Night Average Sound Level (DNL) is an annual energy average. It compresses the noise environment of an entire year into a single number by summing the acoustic energy of every flight, applying a 10 dB nighttime weighting penalty, and averaging. This mathematical operation has a known and documented consequence: because each new aircraft generation is quieter per event than the aircraft it replaces, total DNL can remain nearly flat even as the number of discrete overflight events increases substantially.

This is precisely what the DEIS documents without recognizing its significance. The DEIS forecasts that aircraft operations will increase by approximately 35,000 per year by 2037 under the Proposed Action relative to No Action. Residents in flight-path communities do not experience annual energy averages. They experience individual overflights — each one a discrete disruption event capable of interrupting sleep, triggering cardiovascular stress response, and producing noise annoyance. None of these event-level impacts is captured by a comparison of two DNL values.

The following metrics are better suited to answering WAC 197-11-794’s intensity and magnitude factors:

Metric	Role in Health Analysis
DNL (Day-Night Average Level)	Compresses 365 days into one number; masks added overflight events if per-aircraft noise falls
SEL (Sound Exposure Level)	Single-event metric — captures energy of each overflight; directly predicts sleep disturbance; preferred in FAA National Sleep Study
LAS,max (Max instantaneous level in bedroom)	Primary outcome variable in FAA National Sleep Study; most direct predictor of physiologic awakening probability
N-above thresholds (N60, N65)	Count of events exceeding a set level per day/night; reveals operation-frequency impacts invisible to DNL
Lnight	WHO-preferred nighttime metric; WHO recommends < 40 dB Lnight; not analyzed in the DEIS

IV. Scientific Evidence the DEIS Fails to Address

The DEIS acknowledges in its own literature review that aircraft noise "can have impacts on levels of annoyance and sleep disturbance" and "marginal potential effects on hypertension." It then declines to quantify how many additional people will be affected by those impacts as a result of the Project, because the DNL metric cannot reveal event-frequency effects. The following peer-reviewed literature — including studies commissioned or co-published by the FAA itself — establishes that individual-event and nighttime-average metrics show health impacts at levels the DEIS deems insignificant.

Study	Key Metric	Relevant Finding
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FAA National Sleep Study — Basner et al. (2023)	LAS,max (individual event max level in bedroom)	Primary outcome is exposure-response function between LAS,max and physiologic awakening probability. FAA's own study uses a single-event metric — not DNL — to measure health outcomes. Data collected at 77 U.S. airports; final report expected 2025.
Philadelphia Pilot Study — Basner et al. (2019)	LAS,max / physiologic awakening	Significant exposure-response function ($p = 0.0136$) between maximum aircraft noise event level and awakening probability inferred from heart rate and body movement. Based on 2,375 recorded events.
Atlanta Pilot Study — Basner et al. (2020)	Lmax / self-reported and physiologic awakening	Self-reported awakenings and event-related physiologic awakenings both increased as a function of maximum aircraft noise level during sleep period.
WHO Environmental Noise Guidelines (2018)	Lnight / Lden	Strongly recommends Lnight < 40 dB for aircraft noise. Above this threshold, adverse health effects are documented. At 45 Lden, 10% of population is highly annoyed; at 55 Lden, 26.7%. These thresholds are far below the DEIS's 65 DNL standard.
Endothelial function study — Neimann et al. (2013), European Heart Journal	Leq / individual event count	60 aircraft noise events/night at average 60 dB(A) maximum caused statistically significant impairment of flow-mediated dilation ($p = 0.016$) — an early cardiovascular disease marker — corresponding to only 46.3 dB Leq. Effect occurs far below FAA's 65 DNL threshold.
Cardiovascular consequences review — Baczalska et al. (2022), Frontiers in Public Health	Lnight / Lden	Long-term aircraft noise linked to increased diastolic blood pressure, arterial stiffness, and impaired left ventricular diastolic function. Night noise area residents showed 2x higher insomnia prevalence vs. low-noise controls (33% vs. 16%, $p = 0.046$).

The Basner et al. (2023) FAA National Sleep Study is particularly significant. It is the FAA's own large-scale investigation, conducted specifically to update noise policy, and its primary outcome metric is LAS,max — the instantaneous maximum level of an individual aircraft event in the bedroom — not DNL. If the FAA acknowledges that LAS,max is the appropriate metric for evaluating sleep disturbance at the policy level, the Port of Seattle cannot rely on DNL alone and claim to have conducted a health-adequate analysis under Washington's broader SEPA standard.

The WHO's 40 dB Lnight threshold is similarly dispositive. The DEIS does not calculate Lnight for any receptor location in the study area. Communities in Des Moines, Burien, and SeaTac that experience nighttime aircraft operations are almost certainly exposed to Lnight levels substantially above 40 dB. The number of residents exposed above the WHO threshold — and how that number grows under the Proposed Action — is wholly absent from the noise analysis.

V. Required Supplemental Analysis — Final EIS

The SEPA comment record creates an obligation for the Port to either provide the following analysis in the Final EIS or explain in writing why each is not required. Failure to do so renders the Final EIS inadequate as a matter of law under Washington's "clearly erroneous" review standard. The Port is requested to provide:

#	Analysis Required	Specification
1	SEL Event Counts (N60, N65)	Number of overflight events per day exceeding 60 and 65 dB SEL at representative receptor locations in Des Moines, Burien, SeaTac, and Federal Way — for 2022 baseline, 2032 No Action, and 2032/2037 Proposed Action.
2	Lnight Analysis	Nighttime average noise levels at the same receptor locations, compared explicitly to the WHO's 40 dB Lnight adverse health effects threshold. Identify the number of residents exposed above that threshold under each alternative.
3	LAS,max Distribution	Distribution of individual aircraft event peak levels during nighttime hours (2200–0600), showing the number of events per night at various Lmax thresholds and how that count changes between No Action and Proposed Action by 2037.
4	FAA National Sleep Study Integration	Apply the FAA National Sleep Study's exposure-response function (Basner et al. 2023, final report) to the LAS,max distribution to estimate the additional number of sleep-disturbing events per resident per year attributable to the Proposed Action — or explain in writing why the FAA's own methodology is inadequate for Washington SEPA purposes.
5	Quantified Health Impact Assessment	Using WHO dose-effect relationships and the FAA pilot study exposure-response curves, quantify the additional population expected to experience sleep disturbance and cardiovascular risk. This must be addressed under WAC 197-11-794's 'number of people affected' and 'reversibility' factors — neither of which appears in the DEIS noise analysis.

VI. Conclusion

The SEPA DEIS noise analysis fails on its face to satisfy WAC 197-11-794 because it substitutes a federal numerical threshold for Washington's mandated multi-factor significance determination. The DNL metric, applied exclusively, cannot disclose the health impacts of 35,000 additional annual flight operations on communities that already bear a disproportionate noise burden. The peer-reviewed literature — including the FAA's own National Sleep Study — establishes that individual-event metrics (LAS,max, SEL, N-above) and nighttime-average metrics (Lnight) show documentable health effects at levels the DEIS treats as insignificant.

The Port must conduct the supplemental analysis described in Section V before finalizing the EIS. If it declines to do so, the Final SEAP EIS cannot be found adequate under Washington law.

Key Citations Referenced Above

Basner M, et al. (2023). Effects of Aircraft Noise on Sleep: FAA National Sleep Study Protocol. *Int J Environ Res Public Health*, 20(21):7024.

Basner M, et al. (2019). Aircraft Noise Effects on Sleep — Philadelphia Pilot Study. *PMC6747483*.

Baczalska et al. (2022). Cardiovascular Consequences of Aircraft Noise Exposure. *Front Public Health*, 10:1058423.

Neimann et al. (2013). Effect of nighttime aircraft noise on endothelial function. *European Heart Journal*, 34(45):3508.

WHO (2018). *Environmental Noise Guidelines for the European Region*. Copenhagen: WHO Regional Office for Europe.

WAC 197-11-794. *Washington Administrative Code — Significance, context and intensity*.