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TECHNICAL MEMORANDUM

To: Ms. Jean Fraser, Planner
Planning and Urban Development Department
City of Portland
389 Congress Street
Portland, ME 04101

From: Joseph Czech, P.E.
Principal Consultant

Date: March 7, 2019

Subject: Review of Sound Management Plan

Reference: HMMH Project Number 310430



1. Executive Summary

The City of Portland (the City) contracted with Harris Miller Miller & Hanson Inc. (HMMH) to review the Maine Medical Center's (MMC) Sound Measurement Plan (SMP; MMC 2018a) to determine whether it had the following five (5) characteristics:

- Describes the assessment of actual changes in sound impacts on nearby properties between the helicopter operations at the existing helipad and at the proposed (additional) location. The proposed location is north and east of the existing helipad and therefore is nearer (and higher) to residential and other adjacent properties,
- Includes criteria for mitigation where such impacts are severe based on appropriate national standards,
- Identifies additional study points to account for the proposed helipad location likely not benefitting from the shadow of any MMC or other buildings (the existing helipad enjoys shielding benefits),
- Provides a table of all considered points, their ambient, existing and predicted sound levels and associated explanation of the data and any caveats, and
- Clarifies the process for making mitigation available to any parties meeting the aforementioned impact criteria.

In summary, the SMP lays out a basic methodology but is sparse in detail regarding several facets, including quantitative impact criteria, flight test path description, weather data collection, monitoring location listing/presentation and proposed tabular data (results) presentation. The SMP also should consider measuring ambient sound levels for longer than a day (and at one or two additional locations) and it omitted justification for the properties to be mitigated.

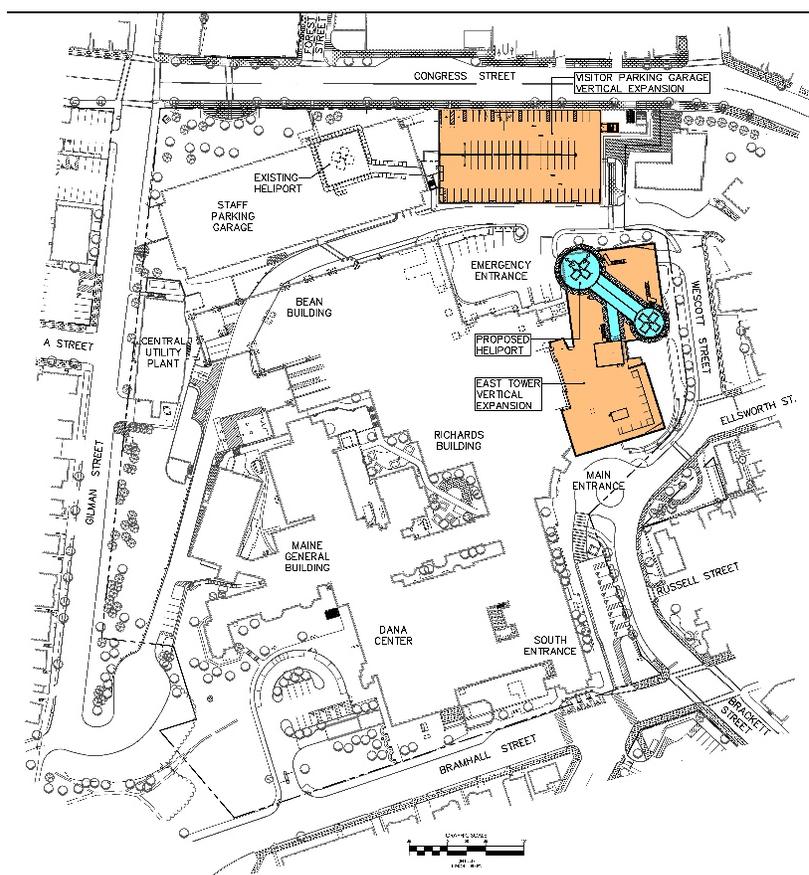
This document, the review of the SMP, is referred herein as "the Review". Section 2 provides background detail to level-set uninitiated readers. Sections 3 through 7 address each of the above items in further detail. Section 8 contains the referenced cited in the Review.

2. Background

The MMC is located at 22 Bramhall Street in the City of Portland, Maine. The MMS has an existing heliport on top of their staff parking garage at an elevation of 174 feet relative to Mean Sea Level (MSL). As part of their Campus Replacement & Modernization Project, the MMC proposes to make the following changes¹ relevant to this Review:

- 1) Vertically expand the East Tower by approximately 41 feet.
- 2) Relocate the existing heliport to the top of the vertically expanded East Tower. The proposed heliport would be approximately 16 feet above the elevation of the proposed East Tower's roof at an approximate elevation of 272 feet MSL.

A snippet of the site plan is reproduced as Figure 1. The proposed heliport would contain two helipads at opposing corners of the East Tower's roof – a larger 54-foot diameter pad and a smaller 40-foot diameter pad. The larger pad would be identically sized to the existing pad and would accommodate (separate) landings of existing air ambulances, United States Coast Guard (USCG) MH-60 Jayhawk helicopters and other military aircraft. The large pad would be more frequently used than the smaller pad, because the smaller pad would only be used in rare cases when the larger pad is in use and a second aircraft is inbound to the Center (Sanders 2018).



Source: "Plan 5 Site Plan.pdf" provided by the City

¹ Per "Plan 5 Site Plan.pdf", "Plan 140 ET Elevations February 22.pdf" and submitted FAA Form 7480-1 "Notice for Construction, Alteration and Deactivation of Airports", provided by the City, and the author's communications with the City.

Figure 1. MMC Site Plan of Existing and Proposed Heliports

As stated in the SMP, its purpose is to define a plan by which (ambient and helicopter) sound will be measured, how proposed helicopter sound levels will be compared to prior sound measurements (including ambient sound levels) and establish a plan for mitigating impacts to surrounding properties using an appropriate national standard (MMC 2018a).

3. Evaluation of Assessment Description

The City requested evaluation of whether the SMP describes the assessment of actual changes in sound impacts on nearby properties between the helicopter operations at the existing helipad and at the proposed heliport.

Conceptually, the SMP's methodology is proper, i.e., measure ambient sound levels, measure test flights, compute Day-Night Average Sound Levels (DNL) from those measurements, and compare the DNL results to published standards. However, some of the details of the methodology bear weakness, as described in the subsections below.



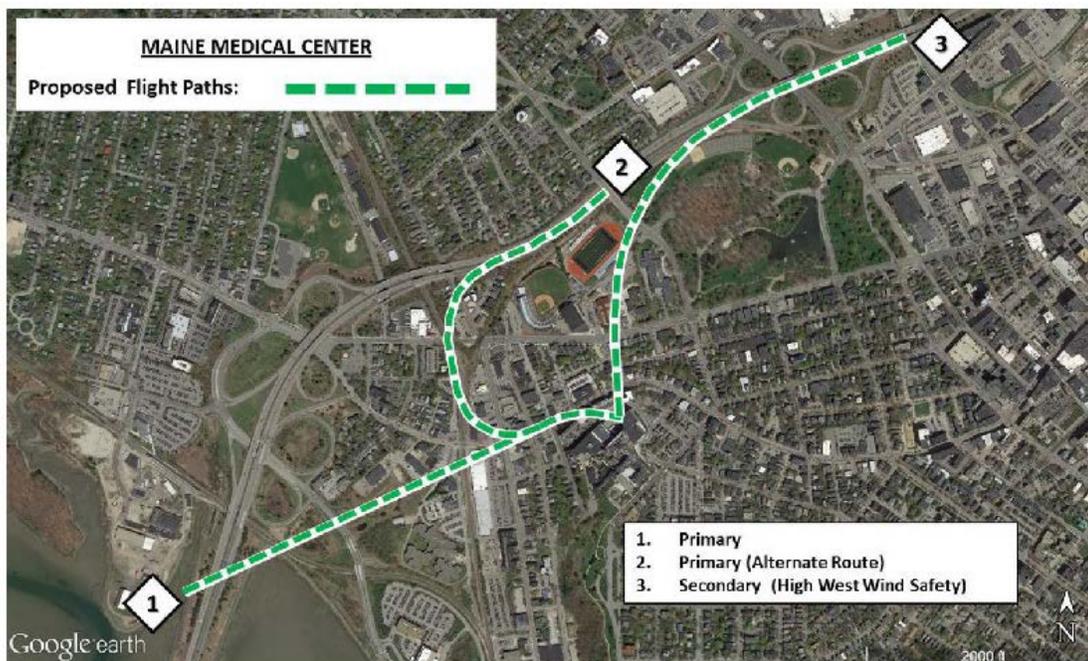
3.1 Ambient Sound Level Measurements

The SMP states they would measure ambient sound levels for one (1) 24-hour day. For unattended “long-term” measurements, one (1) day is the absolute minimum to capture a true DNL and to represent the environment near the MMC. At best, it presents a “snapshot” of the noise environment. If it is not feasible to deploy unattended monitors for a week (with some amount of manned observations), it is recommended to measure at least two (2) 24-hour days, perhaps a typical weekday and a weekend day, to obtain a more representative sample of the noise environment near the MMC. Current monitoring equipment is capable of the storage required for a week’s measurement. If possible, the measurements should be conducted in the spring or summer seasons.

3.2 Flight Test Measurements

The SMP states they will measure four (4) sorties, each consisting of an approach, a 30-second hover and a departure, but is vague about the path/location stating the existing *and* proposed helipads. It is recommended the SMP specify the sorties approach the East Tower, perform a 30-second hover at the approximate elevation of the proposed helipad (simulating a landing to the pad and a takeoff from the pad), and depart the East Tower, on the proposed flight tracks shown in Figure 2 of the 2017 noise study (Russell Acoustics 2017)², reproduced here as Figure 2. Also, the SMP should specify whether the sorties will utilize approach paths 1 or 2 (or a mixture of both) from Figure 2. A mixture, e.g., 2 on each, is preferred. A total of four (4) sorties is probably sufficient, if the flight paths (including altitude and pilot technique) can be documented/verified as being similar to each other, e.g., both flight paths on Track #1, and the approach/departure portions documented/verified as being typical of air ambulance operations.

² It is assumed the proposed flight tracks in this figure are similar to existing flight tracks for the existing heliport.



Source: Russell Acoustics 2017 (Figure 2)

Figure 2. Planned Flight Tracks to Proposed Heliport

3.3 Other considerations

The SMP's Plan for Validation section states it will "calculate DNL from the helicopter flights through mathematical formulas" but omits the formulae. It is recommended the SMP include the formulae.

The SMP should specify the collection of weather data associated with any sound level measurements, at a minimum, temperature, relative humidity, wind speed and direction.

See Section 5 regarding measurement locations and Section 4 regarding significance criteria.

4. Mitigation Criteria for Significant Impacts

The City questioned whether the SMP includes criteria for mitigation where such impacts are severe based on appropriate national standards.

The SMP's section on Standards for Aircraft Sound properly identify DNL as the correct metric for aircraft/helicopter noise but fails to mention the relevant significance threshold(s). The SMP cites 14 CFR Part 150 for airport compatibility planning but should present quantitative criteria. 14 CFR Part 150 specifies 65 decibels (dB) of DNL as being the threshold for residential land use compatibility (i.e., at and above which residential land use is not compatible). Federal Aviation Administration (FAA) Order 1050.1F (FAA 2015) specifies an environmental noise impact would occur if the proposed DNL is greater than or equal to 65 dB DNL and the change between the existing and proposed environment would be at least 1.5 dB DNL. Although Order 1050.1F is only applicable to federal actions, it is recommended the SMP include the federal criteria for determining significant noise impact, absent more applicable criteria.

The SMP's concluding section titled Plan for Validation provides the criteria for mitigation, i.e., sound insulation, stating eligibility is based on the FAA's DNL threshold, but the numerical threshold (65 dB, as recommended above) is not specified.



5. Sufficiency of Study Points

The City asks whether the SMP identifies additional study points to account for the proposed helipad location likely not benefitting from the shadow of any MMC or other buildings (the existing helipad enjoys shielding benefits). The following two subsections respond to the inquiry.

5.1 Presentation and Relevancy

In its section “Location of Sound Devices”, the SMP states it will utilize as many of the previously measured locations as possible to facilitate comparison to the previous studies. Although utilizing *as many of the previously measured locations as possible* is advantageous, the SMP should present or list the locations it plans on measuring, or at least reference them, e.g., Figure 1 from the 2017 noise study (Russell Acoustics 2017). The proposed measurement locations should be shown relative to the proposed flight paths – see Figure 3 below for a rough example. If the proposed flight paths would not differ noticeably from existing flight paths (except for the final approach/initial departure path to the existing and relocated helipads), locations CP-5, 6, 8 and 9 from the 2017 noise study do not seem relevant and can be considered for elimination.



Figure 2. Sample Overlay of Measurement Locations and Flight Tracks

5.2 Unaddressed Locations

Residential locations east of the MMC, i.e., east of Wescott and Charles Streets but north of Bramhall and Ellsworth Streets, are likely enjoying shielding by the (existing) East Tower to arrivals at (and possibly departures from) the existing heliport. Locations CP-3 and CP-4 bracket the area to the north and south, respectively, but there is not a location in between the two. With the vertical expansion of the East Tower and the relocation of the existing heliport to the East Tower, i.e., closer to this set of receptors, those receptors will likely be exposed to more noise from proposed helicopter operations, even though flights would likely be 100 feet higher at the new heliport. The rule of thumb for aircraft sound propagation loss is 6 dB per doubling of

distance. The closest residences (adjacent to Wescott Street) are approximately 680 feet from the existing helipad but would only be approximately 340 feet from the proposed heliport³. This is approximately a halving of distance, which means a potential 6 dB increase in helicopter noise levels, not including the increase in noise associated with the elimination of the East Tower's shielding enjoyed by the existing heliport when the helicopters are near/on the pad(s), or the planned increase in numbers of flights. Therefore, it is recommended a location in this area be added to the SMP.

The six (6) Ellsworth and Crescent Street addresses listed in the SMP's "Plan for Validation/Sound Mitigation" section already identified for mitigation are in the area mentioned above.

If the existing flight paths would be noticeably different (beyond the final approach/initial departure), residential areas not addressed by previously measured locations (or justifiably dismissed) and recommended for inclusion in the SMP are representation of areas:

- In between Tracks #1 and #2 and Interstate 295, e.g., houses along Frederic, Westfield or Hemlock Streets.
- In between Tracks #2 and #3, e.g., houses along Valley and/or Gilman Streets, north of Congress Street.



6. Tabular Data

The City questioned whether the SMP provides a table of all considered points, their ambient, existing and predicted sound levels and associated explanation of the data and any caveats.

The SMP does not provide this information. Examples of some of the tabular data needed are shown in the February 2018 Responses to City's Helipad Questions (MMC 2018b) and in a letter to MMC regarding sound comparisons (Russell Acoustics 2018). The SMP should be amended to contain the tabular data necessary to inform decisions regarding sound mitigation.

7. Mitigation Process and Timetable

The City questioned whether the SMP clarifies the process and timetable for making mitigation available to any parties meeting the aforementioned impact criteria. The SMP lists six (6) properties (on Ellsworth and Crescent Streets) which it says should be mitigated, i.e., sound insulated, but does not provide justification such as specification of sound levels and their increase at these properties.

³ These distances account for the height of the heliports.

8. References

Federal Aviation Administration, FAA Order 1050.1F, Washington, DC, effective July 16, 2015.

MMC 2018a. Maine Medical Center, Sound Measurement Plan, Hospital Helipad Operations, December 21, 2018.

MMC 2018b. MMC Responses to City's Helipad Questions, February 22, 2018 (part 1 of WS S-6C Helipad Comment Responses 2.23.18.pdf).

Russell Acoustics, letter from Norman R. Dotti, PE, PP INCE to Mr. Dennis Morelli, AIA, Manager of Facilities Development, Maine Medical Center, re: "Heliport Relocation Project, Sound Exposure Study Methodology", August 6, 2017.

Russell Acoustics, letter from Norman R. Dotti, PE, PP INCE to Mr. Dennis Morelli, AIA, Manager of Facilities Development, Maine Medical Center, re: "Heliport Relocation Project, Sound Exposure Comparison", February 2, 2018 (part 2 of WS S-6C Helipad Comment Responses 2.23.18.pdf).

Sanders, Jeff. Memorandum to Members of the City of Portland Planning Board, re: "MMC Heliport", January 2, 2018.

