



SR 520 Bridge Replacement and HOV Program



I-5 to Medina: Bridge Replacement and HOV Project

MEMORANDUM

To: Todd Harrison,
Deputy Program Engineering Manager

Contract & Task Order: Y-9761 JX
File Code:

From: Lawrence Spurgeon

Date: August 1, 2016

Copies To:

Subject: Cover letter for draft update to the traffic noise model (TNM) for the Montlake lid

Attached is the draft update to the TNM analysis for the Montlake Lid memo, dated May 26, 2016, completed by Kevin Keller and Ginette Lalonde.

This analysis reflects the current design of the shorter, 800 foot, Montlake lid described in the *SR 520 West Side Final Concept Design Report* published in January 2015. This updated project design was developed by WSDOT in coordination with the city of Seattle, the Seattle Design Commission, and a team of design professionals with input from neighboring communities and key stakeholders.

The attached memo supports a Federal Highway Administration (FHWA) reevaluation of the *SR 520, I-5 to Medina Bridge Replacement and HOV Program Final Environmental Impact Statement* (EIS). The reevaluation will determine if the environmental impacts of the updated project design are consistent with those outlined in the EIS and the Record of Decision (ROD), or if the updated design would introduce new environmental impacts that would require additional review. The reevaluation is expected to conclude in fall of 2016.

Should a future design-build contractor have additional design changes, those changes would be evaluated to determine if there would be any changes to this noise analysis.



MEMORANDUM - DRAFT

To: Anthony Sarhan, FHWA and
Kerry Pihlstrom, WSDOT

Contract & Task Order: Y-9761 JX

From: K. Keller and G. Lalonde

File Code:

Date: May 26, 2016

Copies To:

Subject: Draft update to the traffic noise model (TNM) for the Montlake lid

Introduction

Since the publication of the *SR 520, I-5 to Medina Bridge Replacement and HOV Program Final Environmental Impact Statement (EIS) Noise Discipline Report* (WSDOT 2011) (Final EIS), WSDOT refined the design of State Route (SR) 520 in the area of the Montlake interchange. This memorandum provides updated noise modeling and analysis for the refined design east of Montlake Boulevard and does not include changes to the Portage Bay Bridge profile. For an explanation of terminology and approach, see the *SR 520, I-5 to Medina Bridge Replacement and HOV Program Final EIS Noise Discipline Report* (May 2011).

Final Concept Design Conditions

Noise levels for the Final Concept Design for the Montlake Lid as described in the *SR 520 West Side Final Concept Design Report* (WSDOT 2016) were evaluated using the Traffic Noise Model (TNM) version 2.5. The TNM models developed for the Final EIS were used as the base for the new modeling detailed in this report. The design year 2030 traffic data and receptor locations used in the Final EIS Preferred Alternative were used in this analysis for the Final Concept Design. Changes included in this noise evaluation from the updated Final Concept Design include:

- New vertical and horizontal design of the SR 520 mainline and refinements to ramps modeled using the design files dated November 11, 2015, and profiles dated December 11, 2015
- Changes to the Montlake Boulevard profile and configuration
- Current shorter Montlake Lid design

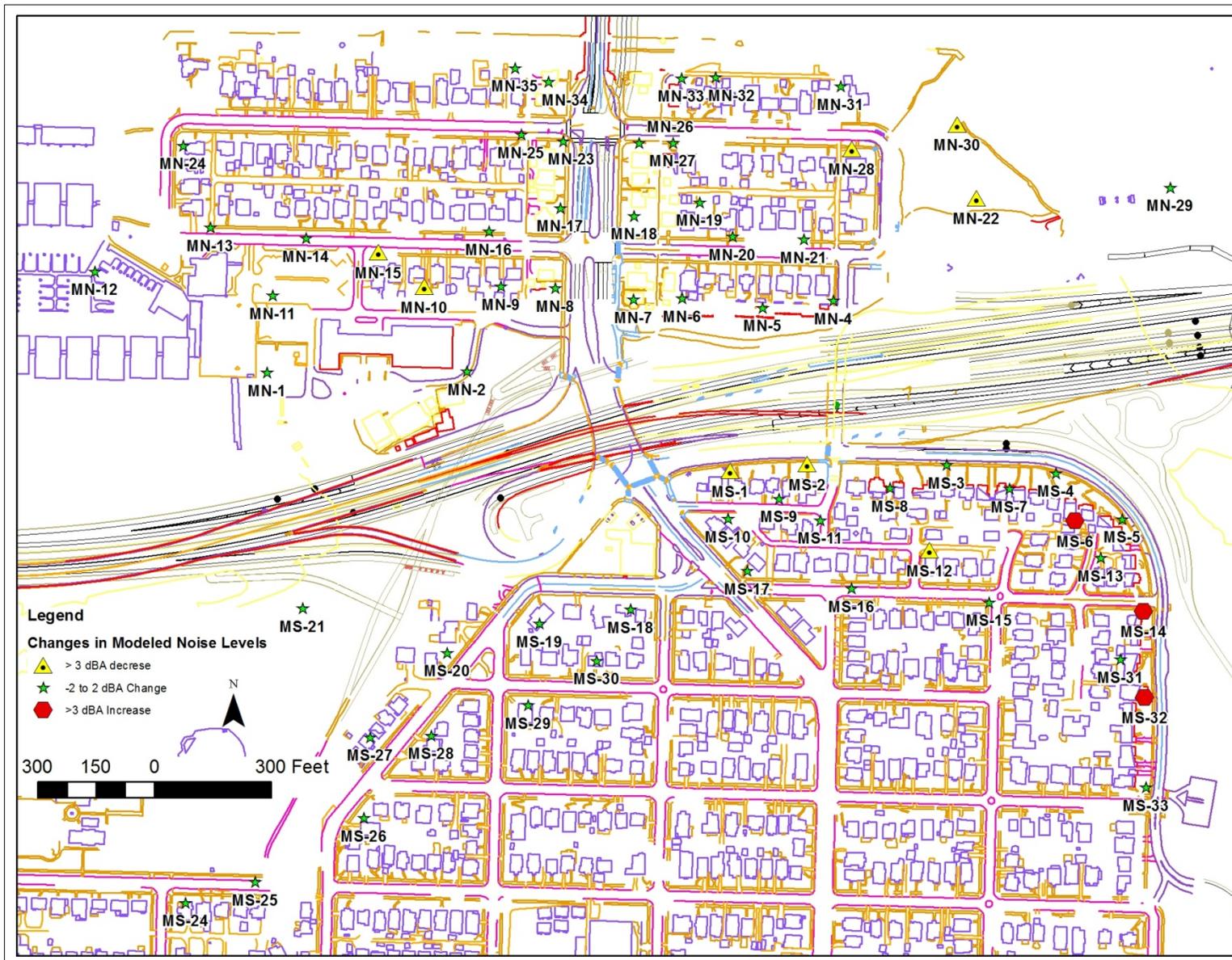
Terrain line and Lake Washington Boulevard East updates to the TNM model

Terrain lines and building rows were added to the TNM file to better reflect the noise environment in the area. Terrain lines were added near the edge of the lid or right-of-way as needed to match planned topography. Building rows were added to improve accuracy at greater distances from SR 520, in some cases allowing arterial traffic noise to dominate noise from SR 520. Elevations along Lake Washington Boulevard East between 24th Avenue East and East Miller Street were updated to correct a data error from prior modeling. In a few places in the base TNM model, the elevations of the roadways and the median barriers did not match, which caused the median barriers to be below the roadways; this was corrected in the new TNM modeling.

Modeling Results

Figure 1 shows the changes in the TNM results for the Final Concept Design relative to the Final EIS Preferred Alternative results in the Montlake area. Noise modeling results range between a 4-dBA decrease and a 6-dBA increase compared to the Final EIS Preferred Alternative results. No new receptors would approach or exceed the Noise Abatement Criteria (NAC) relative to the Final EIS Preferred Alternative results. The greatest increase in modeled levels is in the vicinity of Lake Washington Boulevard East, which is a result of correcting elevation data in the model and not due to the design changes included in the Final Concept Design. The results are detailed by area in the following sections.

FIGURE 1. Changes in Noise Levels (Final Concept Design Compared to Final EIS Preferred Alternative)



North of SR 520

Table 1 shows the changes in the TNM results for the Final Concept Design relative to the Final EIS Preferred Alternative for the area north of SR 520 that is shown in Figure 1. Changes in noise levels would range from a 4-dBA decrease to a 2-dBA increase compared to the Final EIS Preferred Alternative results. These noise level changes result from changes to the roadway design that include the alignment for both west approach bridges shifting to the north; the elevation of the portals changing by 3 feet to 10 feet compared to the previous TNM modeling.

No new receptors would approach or exceed the NAC relative to the Final EIS Preferred Alternative results, nor would any receptor experience a substantial noise increase impact of 10 dBA or higher. One receptor (MN-27), representing three residences, would approach or exceed the NAC for the Final EIS Preferred Alternative; but would have a one dBA decrease under the Final Concept Design. This receptor would not experience noise levels that would approach or exceed the NAC under the Final Concept Design. Noise levels would approach or exceed the NAC at:

- 37 residences under the Final EIS Current Conditions Scenario
- 42 residences under the Final EIS No Build Alternative
- 28 residences under the Final EIS Preferred Alternative
- 25 residences under the Final Concept Design

South of SR 520

Table 2 shows the changes in the TNM results from the Final EIS results for the Final Concept Design relative to the Final EIS Preferred Alternative in the area south of SR 520 that is shown in Figure 1. Changes in noise levels would range from a 3-dBA decrease to a 6-dBA increase. The up to 3-dBA decreases are a result of changes to the roadway design that include the alignment for both west approach bridges shifting to the north; the elevation of the portals changing by 3 feet to 10 feet compared to the previous TNM modeling.

The increases of 3-dBA or more at receptors MS-6, MS-14 and MS-32 are the result of correcting the elevation of the Lake Washington Boulevard East in the base TNM model, which is discussed in detail in the next section of this memorandum.

With the Final Concept Design, two receptors (MS-3 and MS-20), representing nine residences, would have a 2 dBA decrease compared to the Final EIS Preferred Alternative and, as a result would not experience noise levels that would approach or exceed the NAC. No new receptors would approach or exceed the NAC relative to the Final EIS Preferred Alternative results nor would any receptor experience a substantial noise increase impact of 10 dBA or higher. Noise levels would approach or exceed the NAC at:

- 44 residences under the Final EIS Current Conditions Scenario
- 48 residences under the Final EIS No Build Alternative
- 39 residences under the Final EIS Preferred Alternative
- 30 residences under the Final Concept Design

TABLE 1. Noise Levels North of SR 520

| Receptor Number | Residences or Residential Equivalents | Pre Toll Final EIS Current (Leq dBA) | Final EIS No Build Alternative (Leq dBA) | Final EIS Preferred Alternative (Leq dBA) | Final Concept Design (Leq dBA) | Change Final Concept Design relative to Final EIS Preferred (Leq dBA) |
|-----------------|---------------------------------------|--------------------------------------|--|---|--------------------------------|---|
| MN-1 | 3.3 ^a | 69 | 67 | 62 | 63 | 1 |
| MN-2 | 3.3 ^a | 66 | 67 | 64 | 64 | 0 |
| MN-3 | 0 | 75 ^b | — ^b | — ^b | — ^b | — ^b |
| MN-4 | 2 | 67 | 67 | 61 | 63 | 2 |
| MN-5 | 3 | 67 | 67 | 62 | 64 | 2 |
| MN-6 | 3 | 66 | 68 | 67 | 68 | 1 |
| MN-7 | 2 | 69 | 74 | 73 | 73 | 0 |
| MN-8 | 3 | 68 | 71 | 72 | 72 | 0 |
| MN-9 | 3 | 64 | 66 | 65 | 65 | 0 |
| MN-10 | 4 | 64 | 64 | 62 | 58 | -4 |
| MN-11 | 3.3 ^a | 66 | 65 | 61 | 61 | 0 |
| MN-12 | 3.3 ^a | 65 | 64 | 60 | 61 | 1 |
| MN-13 | 4 | 64 | 63 | 60 | 61 | 1 |
| MN-14 | 3 | 64 | 63 | 61 | 60 | -1 |
| MN-15 | 4 | 64 | 63 | 62 | 59 | -3 |
| MN-16 | 4 | 63 | 64 | 64 | 62 | -2 |
| MN-17 | 4 | 68 | 70 | 73 | 73 | 0 |
| MN-18 | 3 | 72 | 73 | 72 | 72 | 0 |
| MN-19 | 5 | 62 | 65 | 64 | 63 | -1 |
| MN-20 | 3 | 60 | 64 | 62 | 61 | -1 |
| MN-21 | 3 | 61 | 63 | 61 | 60 | -1 |
| MN-22 | 3.3 ^a | 63 | 63 | 60 | 57 | -3 |
| MN-23 | 4 | 68 | 70 | 72 | 72 | 0 |
| MN-24 | 3 | 62 | 62 | 59 | 59 | 0 |
| MN-25 | 2 | 63 | 66 | 65 | 64 | -1 |
| MN-26 | 2 | 72 | 68 | 71 | 70 | -1 |
| MN-27 | 3 | 65 | 65 | 66 | 65 | -1 |
| MN-28 | 6 | 60 | 61 | 62 | 59 | -3 |
| MN-29 | 3.3 ^a | 65 | 64 | 62 | 61 | -1 |
| MN-30 | 3.3 ^a | 60 | 60 | 60 | 57 | -3 |
| MN-31 | 4 | 59 | 60 | 61 | 59 | -2 |
| MN-32 | 2 | 62 | 64 | 65 | 64 | -1 |
| MN-33 | 1 | 64 | 66 | 67 | 67 | 0 |
| MN-34 | 1 | 66 | 72 | 69 | 69 | 0 |
| MN-35 | 2 | 63 | 68 | 67 | 67 | 0 |

^a Includes residential equivalents for outside activity areas in McCurdy Park and East Montlake Park, represented by this receptor. The residential equivalents calculation is displayed to the tenths of a decimal.

^b This receptor (MN-3) is near the existing SR 520 alignment and was used only to aid in model verification. Because it is not a location representing a noise-sensitive property, the NAC does not apply.

NOTE: A 3-dBA change would be barely audible.

TABLE 2. Noise Levels South of SR 520

| Receptor Number | Residences or Residential Equivalents | Final EIS Existing Conditions (Leq dBA) | Final EIS No Build Alternative (Leq dBA) | Final EIS Preferred Alternative (Leq dBA) | Final Concept Design (Leq dBA) | Change Final Concept Design relative to Final EIS Preferred (Leq dBA) |
|-----------------|---------------------------------------|---|--|---|--------------------------------|---|
| MS-1 | 4 | 74 | 75 | 75 | 72 | -3 |
| MS-2 | 4 | 74 | 73 | 70 | 67 | -3 |
| MS-3 | 6 | 74 | 72 | 67 | 65 | -2 |
| MS-4 | 3 | 72 | 70 | 68 | 67 | -1 |
| MS-5 | 5 | 70 | 68 | 67 | 68 | 1 |
| MS-6 | 4 | 59 | 58 | 59 | 62 | 3 |
| MS-7 | 4 | 59 | 58 | 59 | 60 | 1 |
| MS-8 | 3 | 61 | 61 | 62 | 62 | 0 |
| MS-9 | 2 | 62 | 64 | 65 | 65 | 0 |
| MS-10 | 4 | 67 | 70 | 70 | 69 | -1 |
| MS-11 | 2 | 60 | 62 | 62 | 62 | 0 |
| MS-12 | 4 | 56 | 57 | 58 | 55 | -3 |
| MS-13 | 4 | 58 | 56 | 58 | 59 | 1 |
| MS-14 | 4 | 60 | 59 | 59 | 65 | 6 |
| MS-15 | 6 | 56 | 56 | 58 | 57 | -1 |
| MS-16 | 4 | 62 | 62 | 63 | 63 | 0 |
| MS-17 | 2 | 73 | 72 | 72 | 72 | 0 |
| MS-18 | 4 | 65 | 69 | 70 | 69 | -1 |
| MS-19 | 4 | 66 | 67 | 66 | 66 | 0 |
| MS-20 | 3 | 66 | 66 | 66 | 64 | -2 |
| MS-21 | 9.2 ^a | 70 | 69 | 62 | 61 | -1 |
| MS-24 | 2 | 63 | 63 | 58 | 57 | -1 |
| MS-25 | 2 | 63 | 63 | 58 | 58 | 0 |
| MS-26 | 4 | 63 | 56 | 56 | 56 | 0 |
| MS-27 | 3 | 65 | 65 | 62 | 62 | 0 |
| MS-28 | 4 | 64 | 65 | 63 | 63 | 0 |
| MS-29 | 4 | 63 | 63 | 63 | 62 | -1 |
| MS-30 | 4 | 64 | 65 | 65 | 65 | 0 |
| MS-31 | 6 | 58 | 56 | 58 | 58 | 0 |
| MS-32 | 4 | 61 | 59 | 60 | 65 | 5 |
| MS-33 | 5 | 64 | 62 | 63 | 65 | 2 |

^a Includes residential equivalents for outside activity areas in Montlake Playfield represented by this receptor. The residential equivalents calculation is displayed to the tenths of a decimal.

NOTE: A 3-dBA change would be barely audible, while a 5-dBA change would be readily noticeableNoise Level effect from terrain line and Lake Washington Boulevard East elevation change

Lake Washington Boulevard East elevation updates to the TNM model

To investigate if the noise level increase of 3 to 6 dBA near Lake Washington Boulevard East is caused by the corrections in elevation to the base TNM model, an Updated Final EIS Preferred Alternative TNM file was created. This diagnostic model updates the Final EIS Preferred Alternative design with the corrected terrain lines, building rows, and roadway elevations for Lake Washington Boulevard East. The changes in roadway elevations for Lake Washington Boulevard East are shown in Table 3 and Figure 2.

Table 4 shows the modeled noise levels of the Final EIS Preferred Alternative, the Updated Final EIS Preferred Alternative and the Final Concept Design. Comparing the results across Table 4 indicates that the increases in sound levels at Receptors MS-6, MS-14, and MS-32 are a result of correcting the terrain line, building rows and roadway elevations of Lake Washington Boulevard East and not a result of design refinement of the project between the Final EIS Preferred Alternative and the Final Concept Design. The final column in Table 4 shows that noise levels of the Final Concept Design would be within 1 dBA of results for the Updated Final EIS Preferred Alternative.

Conclusion

Design changes to the Montlake Lid and SR 520 design for the Final Concept Design would result in a decrease in the number of residences that would approach or exceed the NAC compared to the Final EIS Preferred Alternative. No new receptors would approach or exceed the NAC relative to the Final EIS Preferred Alternative results. Modeled noise levels increases at receptors MS-6, MS-14, and MS-32 result from correcting the modeled terrain lines, building rows and elevation of Lake Washington Boulevard East and not from design refinement.

TABLE 3. **Changes in TNM Elevation—Lake Washington Boulevard East**

| TNM Roadway Point | Final EIS TNM Elevation (feet) | Updated TNM Elevation (feet) | Change in Elevation (feet) (Final EIS to Updated TNM) |
|-------------------|--------------------------------|------------------------------|--|
| 1909 | 64 | 60 | -4 |
| 1910 | 62 | 60 | -2 |
| 1911 | 60 | 60 | 0 |
| 1912 | 58 | 50 | -8 |
| 1913 | 56 | 45 | -11 |
| 1914 | 55 | 40 | -15 |
| 1915 | 55 | 38 | -17 |
| 1916 | 55 | 37 | -18 |
| 1917 | 55 | 36 | -19 |
| 1918 | 55 | 35 | -20 |
| 1919 | 55 | 34 | -21 |
| 1920 | 55 | 34 | -21 |
| 1921 | 55 | 33 | -22 |
| 1922 | 55 | 33 | -22 |
| 1923 | 48 | 34 | -14 |
| 1924 | 41 | 36 | -5 |
| 1925 | 35 | 41 | -6 |
| 1926 | 32 | 45 | -13 |
| 1927 | 29 | 47 | -18 |

TABLE 4. Changes in Noise Levels along Lake Washington Boulevard East

| Receptor | Final EIS Preferred Alternative (Leq dBA) | Updated Final EIS Preferred Alternative (with corrected terrain lines, building rows and Lake Washington Blvd elevations) (Leq dBA) | Change in Noise Levels for Final EIS Preferred Alternative compared to Updated Final EIS Preferred Alternative (Leq dBA) | Final Concept Design (Leq dBA) | Change in Noise level for the Final Concept Design Relative to Final EIS Preferred Alternative (Leq dBA) | Change in Noise Levels for Final Concept Design Compared to Updated Final EIS Preferred Alternative (Leq dBA) |
|----------|---|---|--|--------------------------------|--|---|
| MS-1 | 75 | 72 | -3 | 72 | -3 | 0 |
| MS-2 | 70 | 67 | -3 | 67 | -3 | 0 |
| MS-3 | 67 | 65 | -2 | 65 | -2 | 0 |
| MS-4 | 68 | 67 | -1 | 67 | -1 | 0 |
| MS-5 | 67 | 68 | 1 | 68 | 1 | 0 |
| MS-6 | 59 | 63 | 4 | 62 | 3 | -1 |
| MS-7 | 59 | 60 | 1 | 60 | 1 | 0 |
| MS-8 | 62 | 62 | 0 | 61 | -1 | -1 |
| MS-9 | 65 | 65 | 0 | 64 | -1 | -1 |
| MS-10 | 70 | 69 | -1 | 69 | -1 | 0 |
| MS-11 | 62 | 62 | 0 | 62 | 0 | 0 |
| MS-12 | 58 | 55 | -3 | 55 | -3 | 0 |
| MS-13 | 58 | 60 | 2 | 59 | 1 | -1 |
| MS-14 | 59 | 65 | 6 | 65 | 6 | 0 |
| MS-15 | 58 | 57 | -1 | 57 | -1 | 0 |
| MS-16 | 63 | 63 | 0 | 63 | 0 | 0 |
| MS-17 | 72 | 72 | 0 | 72 | 0 | 0 |
| MS-31 | 58 | 58 | 0 | 58 | 0 | 0 |
| MS-32 | 60 | 65 | 5 | 65 | 5 | 0 |
| MS-33 | 63 | 65 | 2 | 65 | 2 | 0 |

NOTE: A 3-dBA change would be barely audible, while a 5-dBA change would be readily noticeable

Reference

WSDOT 2011. *SR 520, I-5 to Medina Bridge Replacement and HOV Program Final Environmental Impact Statement (EIS) Noise Discipline Report*. Washington State Department of Transportation.

WSDOT 2016. *SR 520 West Side Final Concept Design Report*. Washington State Department of Transportation. http://www.wsdot.wa.gov/NR/rdonlyres/FBE720D3-956A-4D59-AD1F-CCEDAB6A89B1/0/Chapter3_SR520_West_Side_Final_Concept_Design_v2.pdf

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