INSTRUCTIONS GUIDE

How to Use the Bus Lane Metric Tool

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OVERVIEW

This document details how the Bus Lane Metric Tool (BLMT) is structured and how to use the provided Excel spreadsheet **to calculate the BLMT score for potential bus priority lane (BPL) locations.** It also details where the data for the tool come from, and how the BLMT's calculations differ slightly from the bus shelter calculations that LA Metro and StreetsLA already utilize to prioritize bus shelter locations.[1]

LA Metro staff should use the attached spreadsheet to prioritize where BPLs should be established based on ridership, bus frequency, delay time, equity, and air pollution parameters. For each parameter, a higher value indicates a greater need for a BPL, so the location with the highest BLMT score should be prioritized.

Please see the accompanying policy brief for further details on the importance of and rationale for including each parameter in the BLMT. The parameters are listed in Column A of the Excel spreadsheet, with further details in Column B.

HOW DOES THE BLMT WORK?

The BLMT uses a weighted average of the 5 parameters to determine an overall priority score. Unlike a typical average (which considers each value equally), a weighted average assigns a relative importance to each parameter. In the BLMT, for example, ridership is given a larger weight than air pollution, so ridership has a greater impact on the final BLMT score and, therefore, where a BPL should be prioritized. A parameter's weight designates what percent of the final score is allocated to that parameter, so the combined weight of all parameters equals 100%. The weight of each BLMT parameter is shown in Column E of the spreadsheet.

To calculate a weighted average, each parameter must be on the same scale in order to compare their relative value. For example, 40 people may ride the bus in a proposed BPL location that has an equity value of 5. The average of these values would skew heavily in favor of the higher ridership number, even though 40 riders is actually very low relative to busier routes, and an equity value of 5 is the highest possible on a 1–5 scale. Therefore, each parameter value for a BPL location must first be converted to a fraction (between 0–1) of the maximum possible value for that parameter. For example, an equity value of 5 would be converted to 1, and the ridership value would be compared to the number of riders on the busiest LA Metro bus route, e.g., 1,000, and converted to a score of 0.04. These fractions show that the equity value is actually much higher than initially presumed. The converted fraction is then multiplied by its assigned weight to determine a final parameter score. Parameter values (e.g., 40 riders) are shown in Column C, maximum parameter values (e.g., 1000 riders) are shown in Column D, and final parameter scores (e.g., 0.04) are shown in Column F. Column F is then summed to determine the final BLMT score. Because each parameter is calculated as a fraction, the maximum BLMT score is 1.

WHAT ARE THE BLMT PARAMETERS AND WHAT DATA DO THEY USE?

1. **Ridership:** In the proposed BLMT, ridership is defined as the average weekly number of riders who would travel on the proposed BPL. Though ridership would likely increase after the BPL is created, the BLMT ridership should be based on current data because of the uncertainty in the increased ridership. Detailed ridership data were collected as part of the NextGen Bus Plan's Existing Service Performance evaluation, including a breakdown of line performance by both time period and segment of the bus route. LA Metro's ongoing ridership data collection would be ideal for determining the potential use of each considered BPL.

   The BLMT ridership calculation would diverge from the calculation used in LA Metro's existing bus shelter metric, which assigns each potential location a score between 1–6 based on how many riders use the proposed bus stop. By using the average weekly ridership instead of a point-based system, the BLMT would allow a more detailed comparison of ridership at different potential BPL locations.

2. **Bus frequency:** In the proposed metric, bus frequency is calculated using the number of buses that use the proposed BPL each week. Bus frequency data can be obtained from existing GPS trackers on each bus.

   The proposed metric in the spreadsheet differs slightly from the bus frequency calculation used in LA Metro's existing bus shelter calculation. LA Metro's bus shelter metric considers wait time at each stop, which is correlated to frequency. However, it uses a similar point system and only considers if the wait time is less than or greater than 30 minutes. The BLMT captures more granular information on bus delays.

3. **Delay time:** Delay time for the BLMT should be calculated as the average delay time on a bus route during peak weekday hours, defined as 7:00–10:00 am and 3:00–7:00 pm in a previous LA Metro BPL study, calculated over the previous 6 months. Delay information can be collected using data from the existing GPS units on LA Metro buses or during an initial traffic study when identifying possible locations to install a BPL. The bus stop shelter metric does not consider delay time, so there is no previous calculation for reference.

4. **Equity:** The BLMT uses LA Metro's existing Transit Equity Score (TES) as the basis for the equity parameter. The equity parameter should be calculated as the average TES of communities within a given radius of the proposed bus priority lane that would include a significant portion of the potential BPL riders. However, the parameter should also consider the demographics of riders who travel outside of their communities. For example, riders from communities with a low TES score could use a BPL located in an area with a higher TES score, but that lane would still have a large equity impact. LA Metro currently conducts annual on-board surveys that could provide this information.[2]

5. **Air pollution:** The air pollution parameter should be calculated as the average of the air quality index (AQI) for ozone and PM 2.5 (particulate matter with a width ≤2.5 microns) along the stretch of the proposed BPL, calculated over the previous 6 months to capture biyearly changes to air pollution. Ozone and PM 2.5 reflect emission levels from motor vehicles and are, therefore, a good way to measure the effect of emissions on air quality. Air pollution is not considered in the bus shelter

metric, but data are available from multiple sources, including EJ Screen and CalEnviroScreen.

HOW IS THE BUS LANE METRIC TOOL STRUCTURED?

The 5 parameters should be calculated for each potential BPL location and then combined as a weighted average to determine a final score using the BLMT.

1. **Parameter calculations** — As mentioned above, to calculate a weighted average, each parameter value needs to be measured on the same scale. Therefore, each parameter should first be calculated as a percent relative to a maximum possible value so that all parameters range from 0–100. The maximum parameter values should be defined as:
   a. Ridership — There is no fixed maximum number for average weekly ridership, so it should be defined as the average weekly ridership on the busiest LA Metro bus route, calculated over the previous 6 months.
   b. Bus frequency — There is no fixed maximum bus frequency, so it should be defined as the number of buses on the busiest LA Metro route each week.
   c. Delay time — There is no fixed maximum delay time, so it should be defined as the average delay time of the busiest LA Metro bus route during peak transit hours, calculated over the previous 6 months.
   d. Equity — The maximum TES score is 5, as defined in the NextGen Bus Plan.
   e. Air pollution — Though the AQI scale ranges from 0–500, the maximum value in the BLMT should be set at 300, which is the highest value within Level Red: Very Unhealthy, the point at which everyone experiences adverse health effects regardless of preexisting conditions. This lower maximum would allow a wider spread in calculated percentages.
2. **Final BLMT calculation** — Each parameter should be assigned a stipulated fraction of the total score, for a maximum final score of 100. The parameter weights should emphasize:
   a. Implementing BPLs that will impact the greatest number of people; and
   b. Placing special focus on maintaining equity in transit.

To pursue the first goal, ridership and bus frequency should be weighted at 25% and 15%, respectively. For the second, equity and air pollution should be weighted at 25% and 15%, respectively. Comprising 80% of the total BLMT score reflects these priorities. The final 20% of the BLMT score should reflect delay time, which seeks to optimize the efficiency of potential BPLs by installing them where they would have a large impact on transit efficiency. Each parameter should be calculated as outlined in the previous section, multiplied by its weighted fraction, and summed to determine the final BLMT score.

HOW TO USE THE BLMT SPREADSHEET

To use the attached Excel spreadsheet, LA Metro staff should complete Columns C and D, and the final BLMT score will be automatically calculated. Parameter values (Column C) should be determined for each potential BPL location. However, the maximum value for each parameter (Column D) are standard values that should be determined by analyzing existing data. This analysis is detailed in the operational plan and policy brief, and briefly discussed in Column B. The final BLMT score should then be used to determine the priority of each potential BLP location, with higher scores showing priority. The attached Excel spreadsheet currently shows a hypothetical BLMT calculation for a BPL location.

ENDNOTES

1 Audrey Netsawang and Lance Oishi of StreetsLA, conversations with authors, July 19, 2022.

2 Joseph Forgiarini and Stephen Tu of LA Metro, conversations with authors, July 21, 2022.