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June 22, 2021

VIA EDGAR

Office of Life Sciences
Division of Corporation Finance
United States Securities and Exchange Commission
100 F Street N.E.
Washington, D.C. 20549
Attn: Kristin Lochhead
Daniel Gordon
Jane Park
Jeffrey Gabor

**Re: Graphite Bio, Inc.
Amendment No. 2 to Registration Statement on Form S-1
Filed June 21, 2021
File No. 333-256838**

Ladies and Gentlemen:

This letter is being submitted on behalf of Graphite Bio, Inc. (the “**Company**”) in response to comments contained in the letter dated June 22, 2021 (the “**Letter**”) from the Staff (the “**Staff**”) of the Securities and Exchange Commission (the “**Commission**”) to Josh Lehrer, Chief Executive Officer of the Company, with respect to the Company’s Amendment No. 2 to the Registration Statement on Form S-1 filed with the Commission on June 21, 2021 (the “**Second Amended Registration Statement**”). The Company is concurrently filing an Amendment No. 3 to the Registration Statement on Form S-1 (the “**Third Amended Registration Statement**”), including changes in response to the Staff’s comments.

The responses set forth below have been organized in the same manner in which the Commission’s comments were organized and, unless otherwise indicated, all page references in the recitations of the Staff’s comments refer to the Second Amended Registration Statement and page references in the Company’s response refer to the Third Amended Registration Statement as marked. Copies of this letter and its attachments will also be provided to Kristin Lochhead, Daniel Gordon, Jane Park and Jeffrey Gabor of the Commission.

Intellectual Property, page 143

1. *We refer to your disclosure on page 144 regarding the various patent and patent applications in-licensed from IDT. Please restore your disclosure with respect to the applicable jurisdictions of the in-licensed patent and patent applications and also clarify the type of patent protection for the patent and patent applications referenced.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 144 of the Third Amended Registration Statement to address the comment.

2. *We refer to your disclosure on page 147 relating to your license agreement with IDT. Please provide the current expiration date for the fast-to-expire patent licensed under the IDT License Agreement, as well as the aggregate amounts paid to date under this agreement, as applicable.*

RESPONSE: The Company respectfully acknowledges the Staff's comment and has revised the disclosure on page 148 of the Third Amended Registration Statement to address the comment.

If you require additional information, please telephone the undersigned at (415) 733-6071.

Sincerely,

/s/ Maggie Wong

Maggie Wong

Enclosures:

cc: Josh Lehrer, Graphite Bio, Inc.
Shoaib Ghias, Goodwin Procter LLP
Mitchell S. Bloom, Goodwin Procter LLP
Charlie Kim, Cooley LLP
Kristin VanderPas, Cooley LLP
Denny Won, Cooley LLP
David Peinsipp, Cooley LLP