EXHIBIT 1
[FILED UNDER SEAL]

**UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
SHERMAN DIVISION**

The State of Texas, et. al. Plaintiff, v. Google LLC, Defendant.	Case No. 4:20-CV-957-SDJ

Supplemental Expert Report of Jacob Hochstetler

October 4, 2024

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Jacob Hochstetler

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I.   INTRODUCTION

A.   Assignment

1. I have been retained to provide expert analysis and opinions on behalf of all the Plaintiff States in the lawsuit against Google LLC ("Google") asserting violations by Google of federal and state antitrust laws and violations of other state laws, in connection with Google's conduct in the online display advertising industry. On June 7, 2024, I submitted an Opening Report ("Opening Report") that gave technical descriptions of the digital advertising ecosystem, Google's advertising technology stack, and specific technologies and systems used in Google's stack. On September 9, 2024, I submitted a rebuttal report responding to the expert report of Professor Martin Rinard.

2. I have been asked by counsel for the State of Texas, on behalf of all Plaintiff States in this case, to analyze chat log data that was recently produced by Google (the "Log Dataset")[1] to (1) determine the number of daily messages sent by certain individuals employed by Google, (2) quantify the extent to which chat messages were not preserved in these conversations and how often the chat history retention setting was toggled on or off, and (3) analyze the logs in conjunction with chat messages produced in this litigation to determine whether produced conversations were affected by lack of chat message retention.

3. In preparing this report, I have considered all the documents referenced in this report as well as those listed in Appendices A and B.

B.   Qualifications

4. For a description of my qualifications, please see Section I.B and Appendix D of my Opening Report. My expert witness experience, publications, and other qualifications listed therein have not changed.

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[1] The Log Dataset was ordered by the Special Master on July 15, 2024, produced by Google on August 26, 2024, and consists of the following files: GOOG-AT-MDL-C-000088198.CSV, GOOG-AT-MDL-C-000088199.CSV, GOOG-AT-MDL-C-000088200.CSV, GOOG-AT-MDL-C-000088201.CSV, GOOG-AT-MDL-C-000088202.CSV, GOOG-AT-MDL-C-000088203.CSV, GOOG-AT-MDL-C-000088204.CSV, GOOG-AT-MDL-C-000088205.CSV, GOOG-AT-MDL-C-000088206.CSV, GOOG-AT-MDL-C-000088207.CSV, GOOG-AT-MDL-C-000088208.CSV, GOOG-AT-MDL-C-000088209.CSV, GOOG-AT-MDL-C-000088210.CSV, GOOG-AT-MDL-C-000088211.CSV. Counsel for Plaintiffs requested additional information regarding these files on August 28, 2024, and Google responded with answers to certain questions on August 29, 2024, September 23, 2024, and October 1, 2024. These communications are attached hereto as Exhibits A, B, and C.

5. During my employment at Los Alamos National Laboratory, my duties included log collection and parsing analysis for high performance computing applications. This, in combination with my extensive experience administrating operational systems in a variety of settings, along with my experience in conducting forensic source code analyses, qualifies me to opine on the chat logs I analyzed in this report. See Appendix D of my Opening Report for more details on my work experience in these areas.

6. I am being compensated for my time at a rate of $500 per hour. My compensation does not depend on the outcome of this case or on any opinion that I may offer.

II.   SUMMARY OF OPINIONS

7. Google provided a dataset containing logs of Google Chat message metadata for five individuals ("Log Dataset") covering a period of 68 days ("Log Period"), as described in Section IV. Based on my analysis of this data, I have formed the following opinions.

    a. The vast majority of individual messages sent in Google Chat included in the Log Dataset were not preserved because they were sent with the chat history Retention Setting "off". I calculated that more than 87% of all messages, at least 18,566 messages out of a total of around 21,269, were lost in the 68-day period covered by the Log Dataset (which only accounted for five Google employees).

    b. Google's systems did not automatically enforce preservation of chat conversations. History for chats was "off" by default until February 8, 2023, when Google changed the Retention Setting to be history "on" by default. My analysis shows that the five individuals represented in the Log Dataset produced by Google did not personally switch the setting to turn history "on" for any (0%) of the conversations they participated in during the Log Period, per Google's documentation, as I understand they were instructed by Google to do if they were subject to a litigation hold and discussed a relevant topic.

    c. 94.5% of chat conversations (aggregated across the five Google employees represented in the data) had chat history turned off at least for some time during the timeframe covered by the Log Dataset before Google changed the default Retention Setting for each conversation to history "on" (and restricted

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conversations with litigation hold recipients from having their history turned off)[2] on February 8, 2023. Prior to that date, for each of four out of the five individuals, at least 92% of their sent and received messages were not retained.[3] For Google's CEO, Sundar Pichai, more than 96% of all chat messages in the interval before February 8, 2023, were not preserved.

d. The Log Dataset shows that relevant chat conversations produced in this litigation had the chat history Retention Setting set to "off" at some points in the timeframe covered by the Log Dataset, resulting in loss of a significant number of relevant messages. To pick one illustrative example, in a single conversation captured in the Log Dataset which Sundar Pichai was a part of, the Log Dataset contains records of over 300 unretained messages, which constitute around 86% of all the messages recorded in the Log Dataset for this conversation.

8. It is therefore my opinion that the total number of messages not retained by Google employees subject to a litigation hold was a million and a half or more in 2022 only.[4]

III.   BACKGROUND ON GOOGLE'S RETENTION POLICIES WITH RESPECT TO "GOOGLE CHAT" HISTORY

9. Google Chat is Google's instant messaging platform.[5] It is used internally throughout Google for business-related communication and is available for external use by enterprises and general consumers.[6,7] Google Chat succeeded Google Hangouts, with users and conversations

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[2] ▮▮▮ deposition (May 17, 2024), 191:2–191:24.
[3] This statistic excludes information from ▮▮▮, whose message logs represented only a small portion of the Log Dataset, as detailed in Section V.D.
[4] I understand that by the beginning of 2022, 141 Google employees had been placed on litigation hold (Letter from Robert McCallum, August 29, 2024, attached hereto as Exhibit D). Based on an estimated 18,566 messages lost for the 5 individuals represented in the Log Dataset over 68 days, a conservative estimate is that for any given employee, $18{,}566/(5 \times 68) \times 365 = 19{,}931$ messages were lost in a given year prior to the change of the Retention Setting default. This estimate is conservative, since the 68-day period included a popular Holiday period, and one of the individuals included had what appears uncharacteristically low messaging volume. Now, even assuming that half of the employees under litigation hold had left the company by 2022, this comes to about $20{,}000 \times 70 = 1.4$ million messages lost in a single year.
[5] ▮▮▮ deposition (May 17, 2024), 108:11–108:12.
[6] ▮▮▮ deposition (May 17, 2024), 37:7–37:12; 232:6–232:19.
[7] Google Chat Help, "Get started with Google Chat," https://support.google.com/chat/answer/7653601?hl=en&ref_topic=7649316&sjid=15698590992998824646-EU. Accessed on September 24, 2024.

beginning to migrate to Chat in early 2021, before Hangouts was fully discontinued in November of 2022.[8]

10. For discussion purposes, I use the term "Log Dataset" to reference the data produced by Google containing Google Chat log entries for five individuals as described in Section IV. I further use the term "Log Period" for the timeframe covered by the data. I will also use the term "Retention Setting" in reference to the user-facing setting in the Google Chat interface that toggles the history retention "on" and "off," described further in this section.

11. In this report, I will follow Google's conventions for naming different types of chat conversations. A "direct message" is a chat between two individuals. A "group" is a direct message conversation that includes at least 3 participants. According to Google's public help page, "Spaces," a feature within Google Chat, are conversations focused on a specific theme, e.g., a project or a common area of interest.[9] In a Space, a user can "send a message to the entire group in the main conversation or reply directly to a message and create a thread."[10] I will use the term "Group" (note the uppercase "G") to refer to a generic conversation (which could be in a direct message, group direct message, or Space), as this is reflected in the Log Dataset. A "Topic" is a thread or container of replies; a "message" is the individual reply in-thread.[11]

12. Google employs a series of retention policies that determine whether and for how long the conversations within Google Chat are saved in Google's systems. Since 2019, the Google Chat retention policy has been written and maintained by Google's "information governance" team, ███████████████████████[12]

13. The chat retention policy for Google Chat messages is enforced by a technology called Vault.[13] Vault consists of a set of rules that govern how long Google Chat messages are retained.[14] For

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[8] Google Blog, "Upgrading from Google Hangouts to Google Chat," (June 27, 2022), https://blog.google/products/workspace/hangouts-to-chat/. Accessed on September 25, 2024; Google Blog, "The latest on Google Hangouts and the upgrade to Google Chat," (October 15, 2020), https://blog.google/products/workspace/latest-google-hangouts-and-upgrade-google-chat/. Accessed on September 25, 2024.
[9] Google, "Learn about Spaces," Google Chat Help, https://support.google.com/chat/answer/7659784?hl=en-GB. Accessed September 25, 2024.
[10] Google, "Learn about Spaces," Google Chat Help, https://support.google.com/chat/answer/7659784?hl=en-GB. Accessed September 25, 2024.
[11] Exhibit B.
[12] ████ deposition (May 17, 2024), 16:5–17:23.
[13] ████ deposition (May 17, 2024), 18:21–19:5.
[14] ████ deposition (May 17, 2024), 53:3–53:8.

example, one of the rules is "history off." When a given conversation (e.g., a direct, one-on-one chat or a group chat) is set to "history off," the messages within that conversation are automatically deleted 24 hours after they are sent. [15] Google Chat users are able to turn history "on" or "off" for a conversation at any time unless this capability is restricted by the enterprise's administrator.[16,17] Note that while chat history is "off" for a given conversation, this conversation's messages are never made available to Vault or any other Google system, even within the 24-hour window.[18] In other words, there is no way to preserve or restore messages that were sent while the chat history was "off."[19]

14. Conversely, another rule is "history on," which allows messages sent or received within a given conversation with history "on" to be retained by Vault. The exact retention period varies based on various factors, such as the type of chat, ranging from a minimum of 30 days to a maximum of 18 months.[20] For example, after November 18, 2020, the standard "history on" retention period for messages between just two people was 30 days, while the messages in Google Chat rooms (i.e., group conversations with a topic)[21] were retained for 18 months.[22] After that retention period ends, the message is deleted. Interestingly, prior to this, the chat retention policy for a new Google Chat room (as opposed to a chat room started in Google Hangouts), was indefinite. [23]

15. Retention Settings are applied per conversation (as opposed to, e.g., per user). This means that if, for instance, history is set to "off" for a conversation between person X and person Y, messages from both parties in that conversation while the history is "off" will be automatically deleted after 24 hours.[24] Likewise, if a single user in a conversation involving 10 (or 100 or 1,000) users sets history to "off," each message sent from <u>anyone</u> in the chat with history "off"

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[15] ▮ deposition (May 17, 2024), 78:20–79:2.
[16] With the exception of threaded rooms. ▮ deposition (May 17, 2024), 163:2-9.
[17] Google Support, "Turn chat history on or off for users." Historical web page retrieved via Wayback Machine. https://web.archive.org/web/20201112005112/https://support.google.com/a/answer/7664184. Accessed on September 30, 2024.
[18] ▮ deposition (May 17, 2024), 77:7–77:24; 89:20–90:5.
[19] ▮ deposition (May 17, 2024), 91:11–91:16.
[20] ▮ deposition (May 17, 2024), 75:6–75:23.
[21] Rooms are used interchangeably with Spaces throughout Google documentation. See Google internal conversation, "AAAAZhZnT2Q-MBI-THREADED:282CxVdXAFo%%%2021-08-27T01:01:51.776191," GOOG-AT-MDL-B-004290479 at '479 (HCI).
[22] Google internal document, GOOG-AT-MDL-009709520, "Google Chat Retention Policy", (November 18, 2020) at '520 (HCI).
[23] Google internal document, GOOG-AT-MDL-009709520, "Google Chat Retention Policy", (November 18, 2020) at '520 (HCI).
[24] ▮ deposition (May 17, 2024), 79:3–80:7.

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will automatically be deleted 24 hours after the message is sent. The Retention Setting can be toggled "on" or "off" by a user in the settings menu, and the toggled value is then clearly displayed to the users on the Google Chat interface, as shown in the figures below.[25]

16. Figures 1, 2 and 3 below are views of the Google Chat interface taken from a short video Google published on YouTube on June 10, 2022, which shows how to toggle the Retention Setting in the Google Chat interface.[26] Figure 1 gives a view of when history is "on" and shows that the chat interface displays the Retention Setting (red box added). Figure 2 shows how to navigate to and toggle the Retention Setting (red box added). Figure 3 shows that a message is displayed when the setting is toggled "off" (red box added).

Figure 1: Screenshot from a Google-published video describing how to toggle the Retention Setting in the Google Chat interface, with the current Retention Setting clearly visible at the top of the message panel[27]
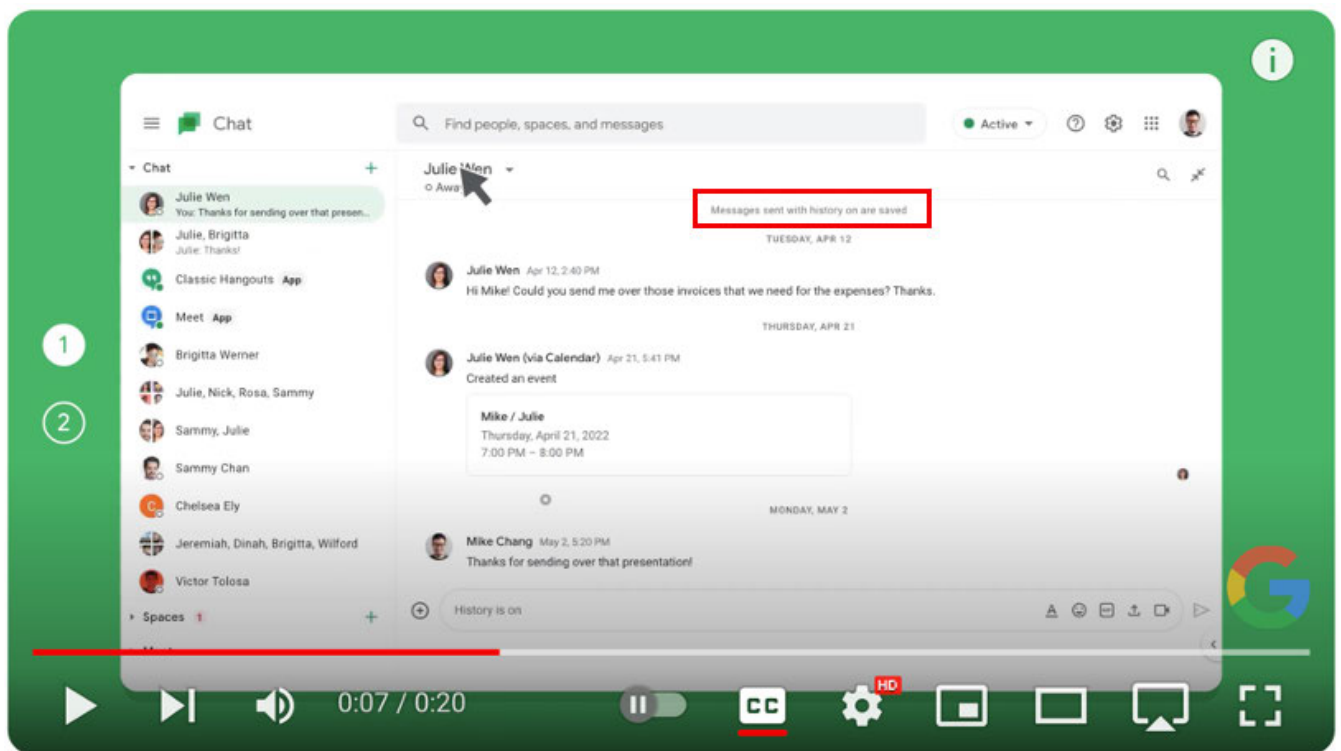
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[25] Google Workspace, "How to: Turn history on or off in Google Chat" (June 10, 2022) https://www.youtube.com/watch?v=TGzxrWpj1zk. Accessed on September 27, 2024.
[26] Google Workspace, "How to: Turn history on or off in Google Chat" (June 10, 2022) https://www.youtube.com/watch?v=TGzxrWpj1zk. Accessed on September 27, 2024.
[27] Google Workspace, "How to: Turn history on or off in Google Chat" (June 10, 2022) https://www.youtube.com/watch?v=TGzxrWpj1zk at 0:07. Accessed on September 27, 2024.

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Figure 2: Screenshot from a Google-published video displaying the Google Chat menu containing the Retention Setting, visible after just one click[28]
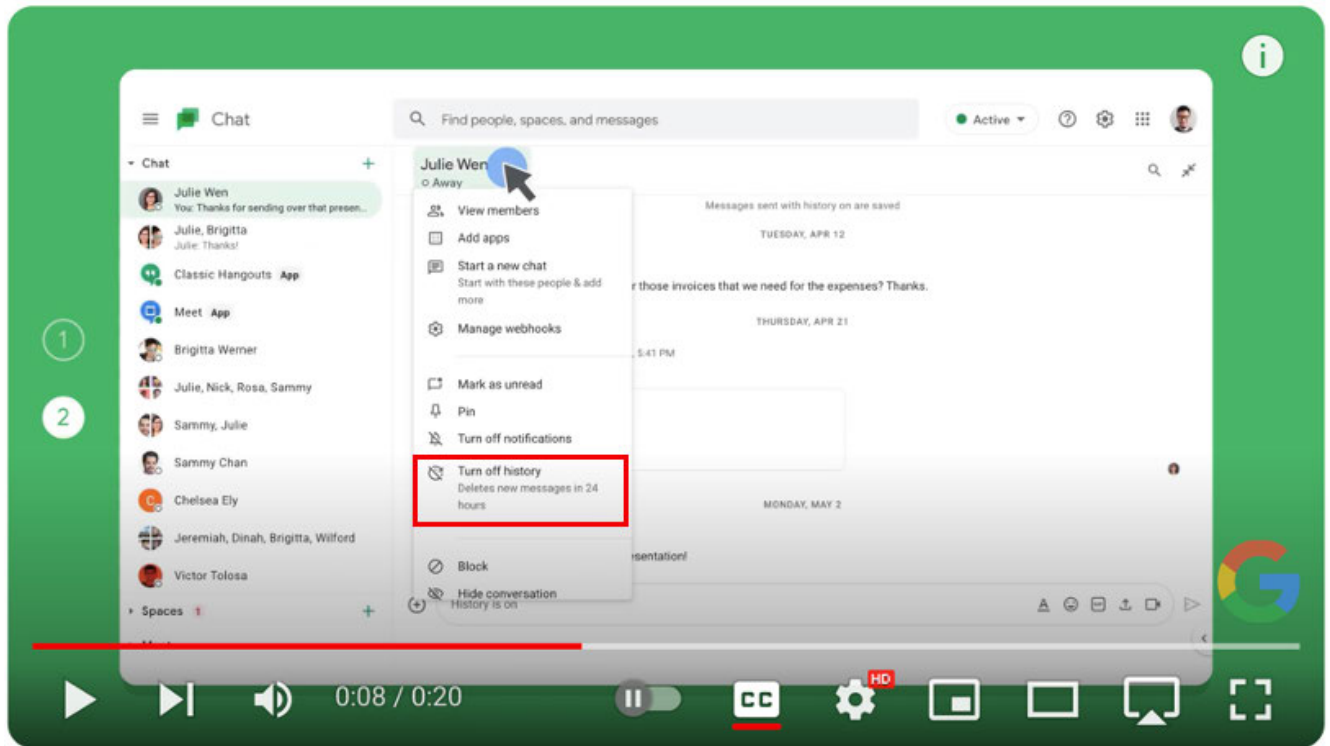
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[28] Google Workspace, "How to: Turn history on or off in Google Chat" (June 10, 2022) https://www.youtube.com/watch?v=TGzxrWpj1zk at 0:08. Accessed on September 27, 2024.

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Figure 3: Screenshot from a Google-published video showing that Retention Setting changes are clearly displayed in the message panel in Google Chat[29]
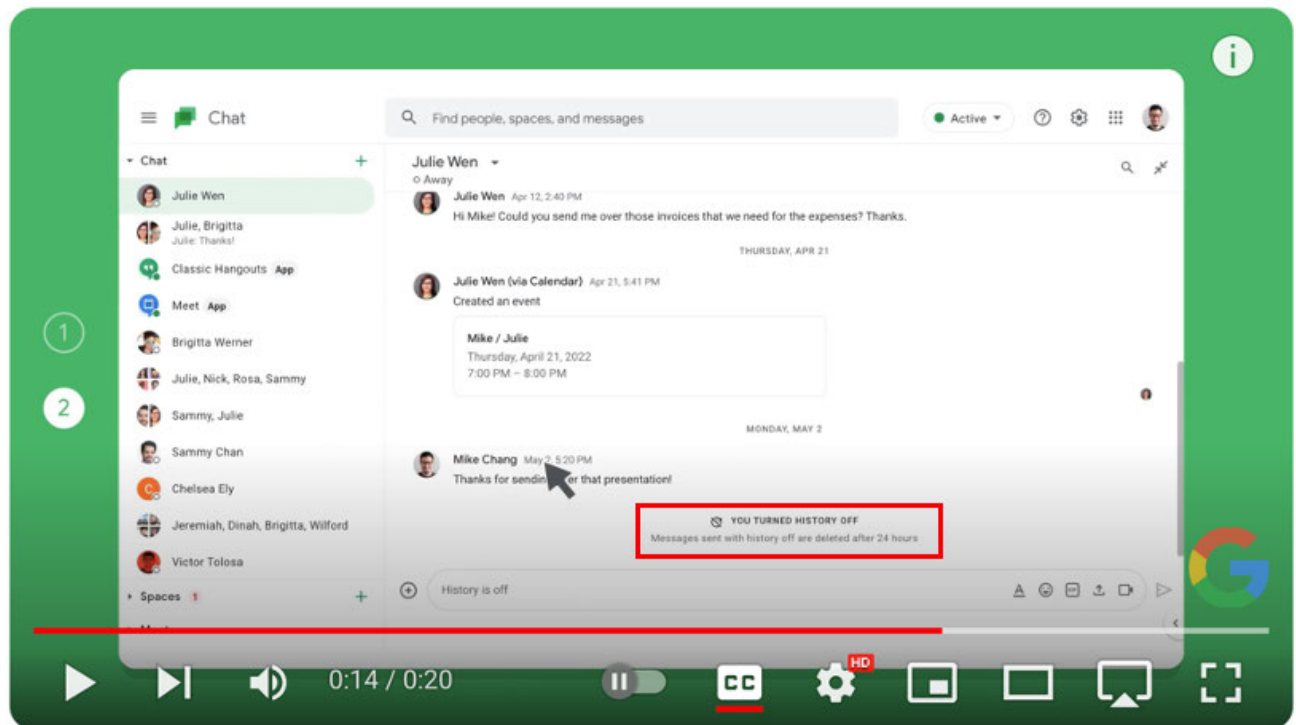
17. Table 1 provides an overview of the different chat history settings and the respective retention periods.

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[29] Google Workspace, "How to: Turn history on or off in Google Chat" (June 10, 2022) https://www.youtube.com/watch?v=TGzxrWpj1zk at 0:14. Accessed on September 27, 2024.

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Table 1: Summary of Google Chat history settings and their corresponding retention periods[30]

Chat History Setting	Retention Period
Chat history turned "off"	No message sent in the chat is ever retained in any of Google's systems. All messages disappear 24 hours after they are sent.
Chat history turned "on"	Messages in the chat are retained for a period of time, depending on the type of chat, and then disappear.
Chat history switched from "on" to "off" mid conversation	Messages sent before the history is turned off are retained for a period of time, depending on the type of chat, and then disappear. Messages after history is turned off are not retained and disappear 24 hours after they are sent.
Chat history switched from "off" to "on" mid conversation	Messages sent before history is turned on are not retained, even if the switch was toggled within the 24-hour period. Messages after history is turned on are retained for a period of time, depending on the type of chat, and then disappear.

18. According to ▆▆▆ the default chat history retention rules within Vault were to be suspended if a litigation hold was issued to a specific employee.[31] I understand that a litigation hold is an instruction to preserve any records of information that are relevant to an anticipated or ongoing lawsuit.[32] ▆▆▆ states that recipients of a litigation hold were instructed that their chat messages needed to be preserved, however, Google did not enforce automatic preservation of these messages until February 2023.[33] Instead, it was left up to the recipients of the hold to identify relevant conversations and turn chat history "on" during those relevant conversations.[34] The recipients' compliance with the litigation hold was not monitored by Google.[35] Note that the enterprise version of Google Workspace, a collection of productivity and collaboration tools including Google Chat,[36] allowed customers to restrict users from

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[30] ▆▆▆ deposition (May 17, 2024).
[31] ▆▆▆ deposition (May 17, 2024), 73:1–73:16.
[32] Thomson Reuters, "Glossary: Litigation Hold," https://uk.practicallaw.thomsonreuters.com/9-501-9293?transitionType=Default&contextData=(sc.Default). Accessed on September 25, 2024.
[33] ▆▆▆ deposition (May 17, 2024), 136:6-13 and 187:6-188:21.
[34] ▆▆▆ deposition (May 17, 2024), 187:16-188:2.
[35] ▆▆▆ deposition (May 17, 2024), 229:12-231:9.
[36] Google Workspace is Google's collection of productivity and collaboration tools (e.g., Gmail, Calendar, Meet, Chat, Drive, Docs, etc.). Google Workspace, https://workspace.google.com. Accessed on September 30, 2024.

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toggling history as early as October 2020.[37] This demonstrates that it would not have been difficult for Google to restrict its own employees using Google Chat from changing Retention Settings at an automated level.

19. In addition, even if a recipient complied with the hold in a timely manner, only messages that were sent or received in a chat conversation after the user turned history "on" could be retained; messages sent and received by that user in that conversation up until turning history "on" would still not be saved, even if their standard retention time (i.e., 24 hours) had not yet elapsed.

20. From 2008 until February 2023, Google's default setting was "history off" for all chats except "new Google Chat threaded rooms," which are group chats with a common topic where users can create "threads" to discuss various sub-topics.[38, 39] ███ testified, however, that even for "threaded rooms," chats were not preserved unless a person subject to the litigation hold *sent* a message in the threaded room. If they only received messages, those messages were also subject to the chat history "off" retention period and disappeared after 24 hours.[40]

21. Google made "history on" the default in Google Chat on February 8th, 2023, and disabled changes to the Retention Setting for conversations that included a litigation hold recipient.[41] In other words, if a conversation includes even a single participant that is under a litigation hold, that conversation's Retention Setting is not only automatically turned "on", but also cannot be changed by any participant of the conversation.

22. Figure 4 demonstrates how changing the Retention Setting impacts message retention.

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[37] Google Support, "Turn chat history on or off for users." Historical web page retrieved via Wayback Machine. https://web.archive.org/web/20201112005112/https://support.google.com/a/answer/7664184. Accessed on September 30, 2024.
[38] Google internal document, GOOG-AT-MDL-009709520, "Google Chat Retention Policy", (November 18, 2020) at '520 (HCI); Lopez deposition (May 17, 2024), 134:12-24; Lopez deposition (May 17, 2024), 100:25–101:8.
[39] Google internal document, "Threading in Spaces PRD," GOOG-AT-MDL-018590555 at '556, '560 (HCI). See the footnote attached to Table 5 for a detailed explanation of threaded rooms.
[40] ███ deposition (May 17, 2024), 180:23-185:12.
[41] ███ deposition (May 17, 2024), 21:2–21:5 and 191:2–191:24.

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Figure 4: A hypothetical conversation demonstrating the impact of chat history settings on message retention
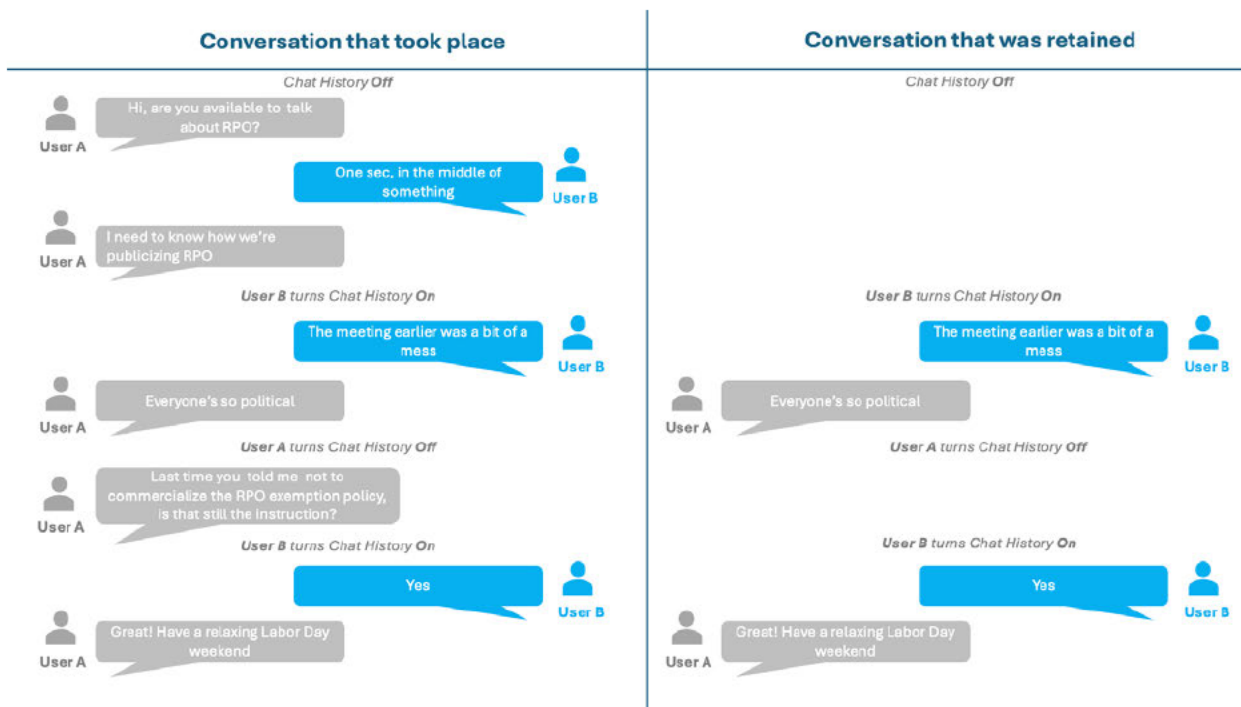
23. Google has system-wide logs for these chats to record ██████████████
██
██
██
███████████ █████████████████████████████████

24. According to Google, these logs are typically used for ███████████████
████████████████████ ███
██
██████████████████████44, 45

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IV.   DESCRIPTION OF THE PRODUCED LOG DATASET

25. The Log Dataset that was provided to me by Google includes a total of 307,473 Google Chat log entries for five Google employees spanning 68 days between December 9, 2022 (the first log in the dataset is timestamped to 12/09/2022 08:02:03.880088 UTC), and February 14, 2023 (the final log included is timestamped to 2/14/2023 06:05:20.429004 UTC). I refer to this time interval as the "Log Period" throughout this report. The set consists of internal logs collected ██████████████████.[46] The dataset is structured into five folders, with each folder named after one of the five Google employees. Each folder contains logs stored as spreadsheet(s)[47] relating to that specific individual.

26. The five individuals and their associated user IDs as well as the number of log entries in each dataset are listed in Table 2.

Table 2: IDs of individuals and corresponding counts of logs present in the Log Dataset

Name	ID	Number logs in dataset
██████████████████[48]	822585612505	78,145
████████████[49]	284880796141	15,830
Sundar Pichai (CEO)[50]	615040071232	55,211
██████████[51]	236660504153	72,507
████████████[52]	595355537959	85,780

27. My analysis shows that the log entries contain messages sent as well as received by each individual, but they do not appear to be exhaustive in received messages. As I will discuss further below, I found evidence for at least one received message for which no corresponding log entry appears to exist. Furthermore, the logs contain a number of actions that are not related to sending and receiving messages, for instance, ████████████████████ ████████████████████. Thus, the actual number of messages included in the dataset is lower than the number of logs suggest. In particular, for ██████ there are only 36

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[46] Exhibit C.
[47] More specifically, these spreadsheets were provided in a CSV format.
[48] Provided in GOOG-AT-MDL-C-000088204.CSV, GOOG-AT-MDL-C-000088203.CSV and GOOG-AT-MDL-C-000088202.CSV.
[49] Provided in GOOG-AT-MDL-C-000088205.CSV.
[50] Provided in GOOG-AT-MDL-C-000088210.CSV and GOOG-AT-MDL-C-000088211.CSV.
[51] Provided in GOOG-AT-MDL-C-000088198.CSV, GOOG-AT-MDL-C-000088199.CSV, GOOG-AT-MDL-C-000088200.CSV, and GOOG-AT-MDL-C-000088201.CSV.
[52] Provided in GOOG-AT-MDL-C-000088209.CSV and GOOG-AT-MDL-C-000088208.CSV, GOOG-AT-MDL-C-000088207.CSV and GOOG-AT-MDL-C-000088206.CSV.

sent messages in the Log Period, which is a much lower message volume than the other individuals represented in the Log Dataset.[53]

28. I now discuss the format and contents of the data in more detail. Each spreadsheet comprising the Log Dataset contains 7 columns. Table 3 lists the names and descriptions of each column.

Table 3: Log dataset columns

Field name	Description
██	██

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[53] This could be due to the holiday season and does not necessarily reflect ███████ typical message volume.

[54] Exhibit A.

[55] RPC is a protocol that allows users to run procedures on a remote server as if they were running locally on their own machine. See IBM, "Remote Procedure Call", https://www.ibm.com/docs/en/aix/7.3?topic=concepts-remote-procedure-call. Accessed on September 25, 2024.

[56] Exhibit A.

[57] Google internal conversation, "AAAAZhZnT2Q-MBI-THREADED:282CxVdXAF0%%%2021-08-27T01:01:51.776191," GOOG-AT-MDL-B-004290479 at '479 (HCI).

[58] Google, "Learn about Spaces," Google Chat Help, https://support.google.com/chat/answer/7659784?hl=en-GB. Accessed September 25, 2024.

[59] Exhibit B.

[60] Exhibit C.

[61] See Google internal document, GOOG-AT-MDL-018586767, "G Suite Essentials on Flex Orgs M1", (March 30, 2020) at 767. Google Hangouts has since been discontinued. See ███████ deposition (May 17, 2024), 107:10–107:11.

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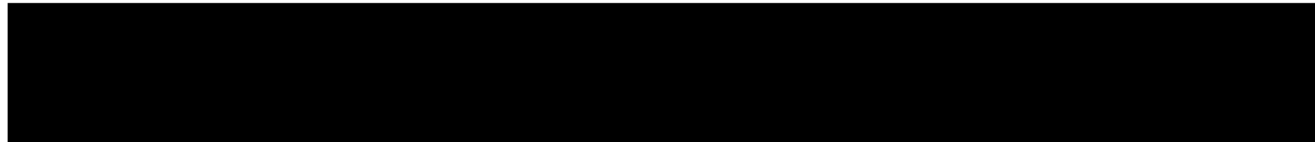
[REDACTED]

29. My analysis found that a message that is sent typically generates both a frontend and a backend log entry. [62] Both frontend and backend server log messages within the [REDACTED] column typically contain several metadata fields. I list the key fields below in Table 4. This table is not exhaustive and excludes fields that are not relevant to my analysis.

Table 4: Log message fields

Field name	Description
[REDACTED]	[REDACTED]

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[62] I have seen slight discrepancies in overall numbers of frontend and backend entries, as apparent in the data I present in Section V.E. I will not speculate as to what causes this discrepancy.

[63] Exhibit B.

[64] Spaces and Direct Message chats with 2 or more members "work in different ways and serve different purposes." For example, message history for Spaces is "on" by default and retained based on an organization's policy while DM message history can be turned "on" or "off" (for personal accounts) or is dependent on an organization's settings (for Google Workspace accounts). Another example is that users in a Space can see a list of files shared while DM users cannot. See Google, "Learn about Spaces," Google Chat Help, https://support.google.com/chat/answer/7659784?hl=en-GB. Accessed September 25, 2024.

[65] Exhibit B.

[66] Exhibit B.

[67] Exhibit B.

[68] Exhibit B.

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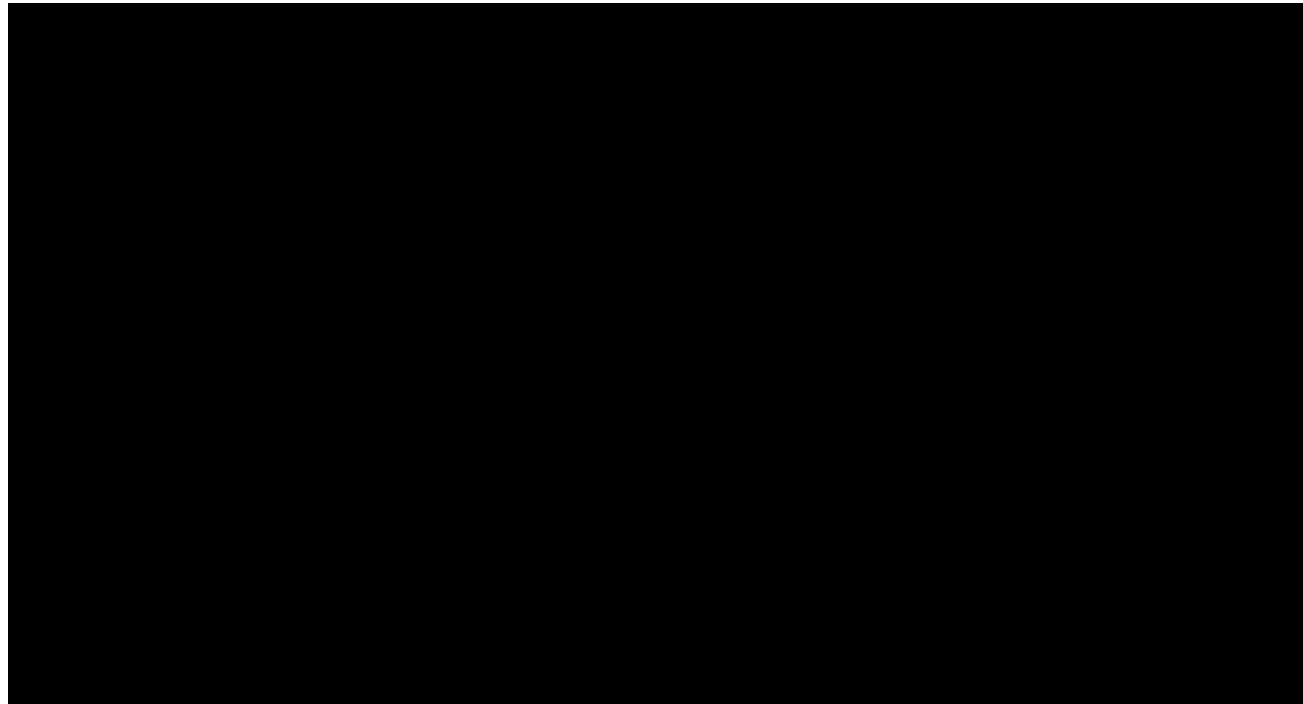
30. I note that, as explained in the tables above, the ▮▮▮▮▮▮ field may be missing for certain actions. It is my understanding, based on Google's representations, that if a ▮▮▮▮▮▮ field is missing in the Log Dataset, it is unrecoverable.[75] I found in my analysis that the ▮▮▮▮▮▮ field contained in the log metadata is more commonly populated (and coincides with ▮▮▮▮▮▮ when both are populated), which is why I performed my analysis of sent messages based on information in the ▮▮▮▮▮▮ field.

31. Below are example log messages in ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ that include retention expiration.

32. Example of a frontend log message with a retention state set to "history off":
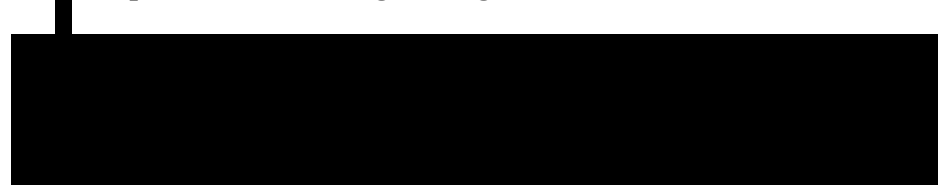
---

[69] ▮▮▮▮▮▮ has been capitalized for consistency since it appears in the logs as a capitalized variable, though in the email cited, it was not capitalized.

[70] Exhibit A.

[71] Exhibit B.

[72] ▮▮▮▮▮▮▮▮▮ has been capitalized for consistency since it appears in the logs as a capitalized variable, though in the email cited, it was not capitalized.

[73] Exhibit A; Exhibit B.

[74] Exhibit B.

[75] Exhibit C.

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33. Example of a backend log message with a retention state set to "history off":
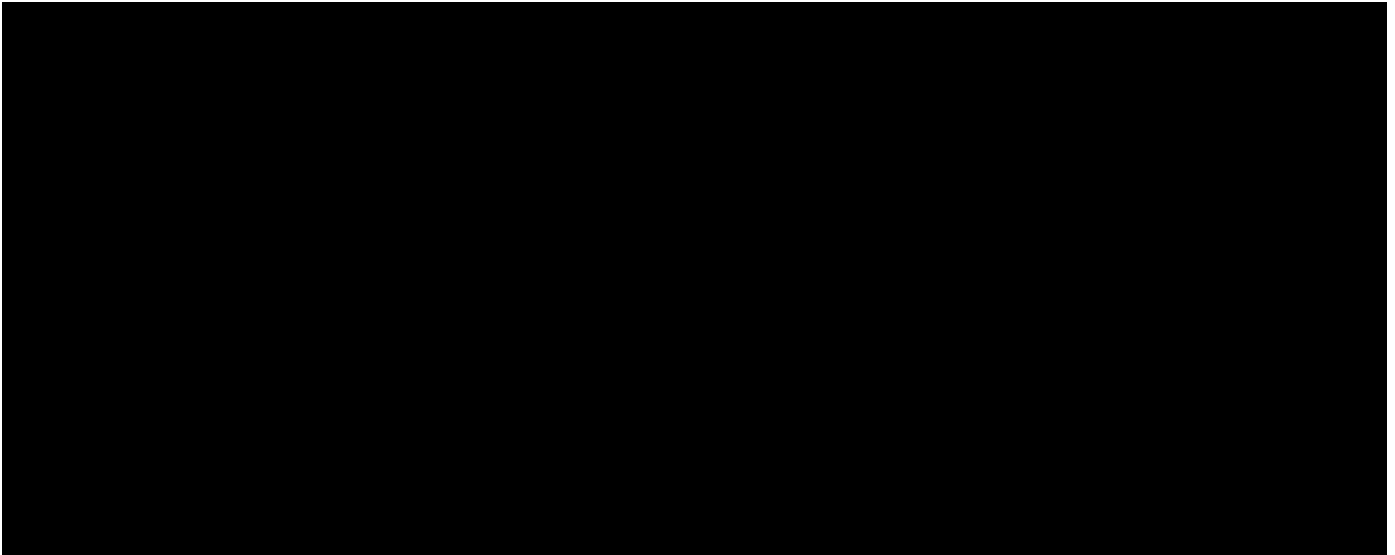
34. Due to the large number of logs (as shown in <u>Table 1</u>), I wrote a program to prepare the dataset for my analysis (see Appendix C). In summary, the program performs the following steps:

    a) Iterates through each spreadsheet in each folder.

    b) Within each spreadsheet – identifies and records the timestamp, ███████ ████████████████████████████████████ into a custom data structure called `Record`. Specifically, the values for ████████ and ███████████ were extracted from the log message under the ████████████████████ column; other fields' values were extracted directly from the remaining columns themselves. Each `Record` created represents one row in the spreadsheet.

    c) Sorts all `Record` data structures for a given spreadsheet in chronological order based on the timestamp.

    d) Combines all `Record` data structures for an individual, and stores them, along with the individual's name, in a key-value map called `personRecords`.

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[76] See GOOG-AT-MDL-C-000088202.CSV row 31

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Additionally, a list of the individual's names, called `people`, is also created. Both `personRecords` and `people` are used in my analyses in Sections V and VI.

V. ANALYSIS OF THE LOG DATASET SHOWS THAT MORE THAN 87% OF MESSAGES SENT BY THE INDIVIDUAL EMPLOYEES WERE NOT RETAINED DURING THE LOG PERIOD

35. I analyzed the Log Dataset to determine the frequency with which the five Google employees sent messages with history retention toggled "on" or "off," as indicated by the ▮▮▮▮▮▮▮▮▮ field in the chat logs. As mentioned in Section IV, this analysis was aided by the program that I wrote (see Appendix C).

36. As I discuss in this section, I found that the vast majority of messages sent and received by the five individuals during the Log Period (at least 18,566 out of an estimated total of 21,269 – over 87%) were sent and received with chat history "off" and were thus not retained.

A. Action types present in the Log Dataset associated with `retention_state`

37. I began my analysis by determining the action types that are associated with sending and receiving messages and for which a ▮▮▮▮▮▮▮▮ field is specified. I identified such action types by analyzing the Log Dataset, as well as the documentation Google produced with the dataset.[77] Table 5 summarizes these actions.

Table 5: Actions associated with sending and receiving messages and with a retention_state field specified

ID	Action	Definition[78]

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[77] Google internal document, "List of Log Fields," GOOG-AT-MDL-C-000088212 (HCI).
[78] ID and Definition are taken from the documentation provided by Google. See Google internal document, "List of Log Fields," GOOG-AT-MDL-C-000088212 at '214-'224 (HCI).
[79] Threads enable users to reply to a specific message in the chat, which creates a "side chat," allowing the users to further discuss a particular topic without disrupting the main conversation stream. Threaded rooms (or spaces) are rooms/spaces where users can create topics for other members to reply to. Google's legacy threading model was to display all replies to threads in the main conversation organized by topic. In contrast, inline threaded rooms (or spaces) follow Google's updated threading model and display replies to threads in a side panel. See Google internal document, "Threading in Spaces PRD," GOOG-AT-MDL-018590555 at '556, '560 (HCI).

19

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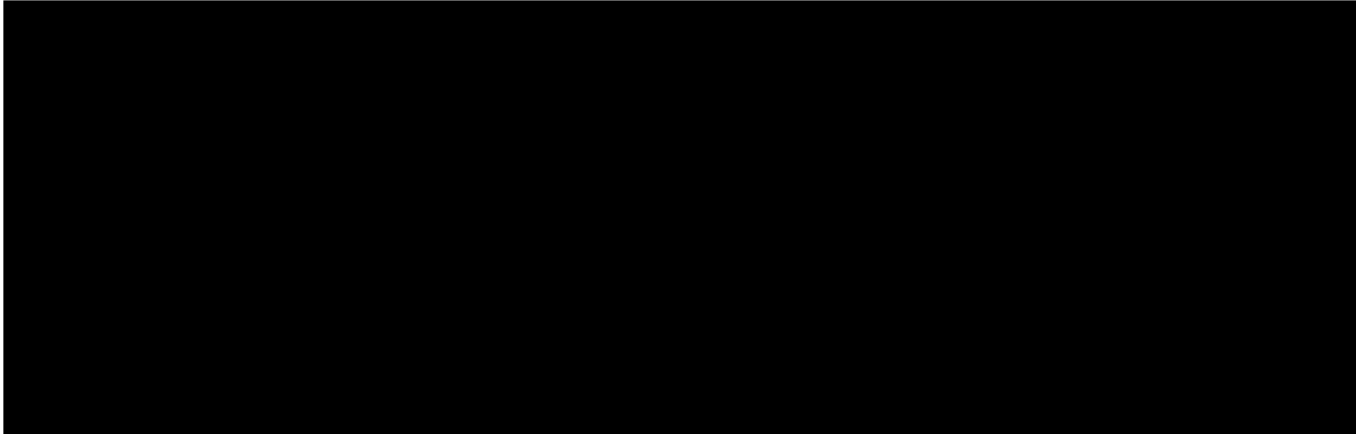
38. The metadata associated with the actions shows that actions starting with ███████████ are frontend server logs, while those starting with '███████' are backend server logs. The ███████████ action represents message notifications received by identified users. However, Google documentation describes this action as ███████████[80] suggesting that there might be a separate █████ behavior that does not appear in the Log Dataset. As I discuss in Section VII, my analysis confirmed that not all received messages are included in the logs.

39. Table 6 lists the key actions that are related to changing of retention status, per the documentation provided by Google.[81]

Table 6: Actions directly related to changing retention per Google-provided documentation

ID	Action	Definition

B. None of the five individuals represented in the Log Dataset personally changed Retention Settings for Group chats

40. In my analysis, I intended to (i) identify whether the ███████████ ███████████ is present in the Log Dataset, which indicates whether any of the 5 individuals represented in the Log Dataset changed the retention settings

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[80] Google internal document, "List of Log Fields," GOOG-AT-MDL-C-000088212 at '215 (HCI).
[81] Google internal document, "List of Log Fields," GOOG-AT-MDL-C-000088212 at '213 (HCI).
[82] Google internal document, "Babel Primer/Design Doc," GOOG-DOJ-AT-00932521 at '530 (HCI).

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for a Group chat (see Table 6), and (ii) report the individual who changed the setting and the frequency of the changes. I found no instance of this action in the produced Log Dataset, which indicates that **none of the five individuals represented in the Log Dataset** *personally* **changed the chat history Retention Setting of any of their conversations during the Log Period**.

41. However, as I will show in Section VI, there are instances in the Log Dataset when ████████████████ changed despite the lack of corresponding ████████████████████ ████████████████████████ actions in the dataset, indicating that the ████████████████ was changed by a different chat participant. As I discuss in Section III above, the Retention Setting is applied per conversation. Therefore, if another participant changed the Retention Setting for a conversation that includes one of the individuals in the produced data, this change would apply to all participants of the conversation, including that individual.[83] Figure 4 above illustrates such a hypothetical conversation. The action would be associated with the user ID for user A and would not be contained in the logs associated with user B, but the Retention Setting itself applies to both users A and B.

42. In addition to ████████████████████████████████████, I identified two related actions in the provided documentation, though they were not specifically called out by Google as relating to chat retention. Namely, the corresponding backend log ██ ██ ████████████████████████████████.[84] I found no logs corresponding to these actions in the Log Dataset.

C.   One action identified in Google's documentation as related to chat retention has no apparent connection with retention changes

43. Google's documentation produced along with the Log Dataset indicates the action ████████████████████████████████ was related to chat retention settings (see Table 6).[85] This action was found twice in the logs. These instances occurred on

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[83] See the hypothetical chat example in Figure 4: A hypothetical conversation demonstrating the impact of chat history settings on message retention that demonstrates how chats are retained as a result of one participant's change to the history retention setting.
[84] Google internal document, "List of Log Fields," GOOG-AT-MDL-C-000088212 at '216-'217 (HCI).
[85] Google internal document, "List of Log Fields," GOOG-AT-MDL-C-000088212 at '213 (HCI).

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December 13, 2022, in the dataset for Mr. Pichai,[86] roughly two minutes apart from each other:

- `Tuesday, December 13, 2022 5:31:38.710 AM UTC:` ██████████████████████████ ████████████████████████████████

- `Tuesday, December 13, 2022 5:33:14.038 AM UTC:` ██████████████████████████ ████████████████████████████████

44. Neither log line showed any information about the nature of the change to the group. The corresponding message log lines related to the group ID referenced in the logs ("███████████ were from the frontend to the backend, and their retention state is ██████████[87]

- Thursday, December 15, 2022 6:39:11.170 PM UTC

  ██████████████████████████████████████
  ██
  ██
  ██
  ████████████████████████████

- Thursday, December 15, 2022 6:39:11.202 PM UTC

  ████████████████████████
  ██
  ██
  ██
  ████████████████████████

45. Based on the information available to me, notification settings changes do not have an obvious connection to retention changes. The logs for the notification change do not include any retention information, and I find no other indication in the logs for this Space that they impact the Retention Setting. This contradicts Google's provided documentation mentioned above, where Google indicates that ██ is related to chat retention settings.[88]

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[86] GOOG-AT-MDL-C-000088210.CSV

[87] GOOG-AT-MDL-C-000088210.CSV

[88] To further support my conclusion that the notification settings changes are not connected to a change in the Retention Setting, in his testimony in the litigation "In re Google Play Store Antitrust Litigation," Sundar Pichai testified that he never changed this setting to preserve the chats. See Bensinger, G. (2023, November 14). Alphabet CEO, in Play store trial, acknowledges some materials not retained. *Reuters*. https://www.reuters.com/technology/alphabet-ceo-play-store-trial-acknowledges-some-materials-not-retained-2023-11-14/. Accessed September 26, 2024.

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D.   Overview of the volume of messages sent by each individual represented in the Log Dataset

46. Before discussing the message retention settings in more detail, I provide an overview of the volume of messages sent by each individual during the discussed time period. Table 7 includes the total count of messages sent (including those sent with or without history retention activated) and average number of messages sent per day (on days when the individual was sending at least one message – the timespan in question includes holidays and weekends, during which the logs show that most of the individuals were not actively messaging). To generate these statistics, I used the counts of backend logs (that is, actions starting with ███████████) in order to avoid double-counting messages due to inclusion of frontend and backend logs. There is a wide variation in message volume between the different employees in the Log Dataset.

Table 7: Volume of messages sent, measured as counts of backend logs for created topics and messages[89]

User	Total number of sent messages in Log Period	Average number of sent messages on days with activity
███████	2,581	61.45
	244	7.18
Pichai	2,978	47.27
███████	36	3
███████	5,230	118.86

E.   Quantification of actions with history retention turned off by individual

47. I now turn to the quantification of actions with history retention turned "on" versus "off." Table 8 contains counts and percentages of ████████████ for the eight action types in the Log Dataset that included a ████████████ key in the ████████████ dictionary (see Table 4).[90] For all listed actions except the two related to ████████████ (of

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[89] Other Google employees (not represented in the Log Dataset) provided deposition testimony in which they estimated sending or receiving hundreds of individual chat messages on a daily basis, suggesting that the numbers of sent and received messages for each individual represented in the Log Dataset (shown in Table 7) are not uncommonly high and are much lower than others who would have been under the litigation hold. See ████ deposition (April 5, 2024), 258:23-25, "I think it's reasonable to think that on some days I have hundreds of chats."; ████ deposition (April 12, 2024), 66:16-24, "between all the different individual chats, group chats, it could easily be over a hundred messages"; Korula deposition Vol. I (April 19, 2024), 297:6-19, "Q: [H]ow many [individual] chats [messages] . . . would you say you send or receive on a daily basis?" "A: [I] would guess 500 individual messages maybe."
[90] This analysis was performed using the tables in the spreadsheet all_retention_states.xlsx, which I created using the program I wrote (Appendix C). The spreadsheet is provided with my report.

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which there are only 184 in total), the vast majority of logged actions in this dataset have ███████████ set to ███████████.

Table 8: Counts of actions referencing retention state fields inside dynamite server extension

Action	EPHEMERAL_ONE_DAY	PERMANENT
███		

48. In the following subsections, I discuss in detail the messaging data for each individual, showing that the same patterns hold for each of them. Table 9 summarizes the analysis and shows how many messages were sent with the ███████████ field set to ███████████, throughout the Log Period, as well as specifically for the timeframe before February 8, 2023, when Google changed the default Retention Setting to ███████████.

Table 9: Summary of analysis[92]

User	Number (proportion) messages sent that were not retained, full dataset	Number (proportion) messages sent that were not retained, before 2/8/23	Number (proportion) of logs for messages received that were not retained, full dataset	Number (proportion) messages received that were not retained, before 2/8/23
Pichai	2,613 (87.7%)	2,435 (96.2%)	5,441 (86.2%)	5,198 (92.5%)
██████	2,346 (90.9%	2,207 (94.8%)	13,344 (89.5%)	12,885 (92.9%)
	235 (96.3%)	217 (98.6%)	332 (93.8%)	312 (98.7%)
	23 (63.9%)	23 (65.7%)	44 (53.0%)	44 (56.4%)

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[91] Based on my analysis of the Log Dataset, for each message that is logged with the ████████████████████████████████ action, typically 3 log entries are generated. I discuss this further in Section VII. However, I have also seen examples of messages which appear to only have generated one or two corresponding ████████████████████████████ entries, based on their timestamps.

[92] As I discussed above, there are typically (but not always) 3 log entries for received messages, so that the number of actual messages received is likely close to one third of the number of logs reported in columns 3 and 4 of this table.

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|	4,375 (83.7%)	4,106 (92.4%)	7,763 (87.9%)	7,335 (95.1%)
███████				

1. Sundar Pichai

49. Table 10 shows the breakdown of logs for retained and non-retained messages sent or received by Pichai during the Log Period, separated by action type. 10,628 out of 12,224 logs, or **86.9%** of the logs, have the ███████████ field set to ███████████. As I mentioned above, the ██████████ and ██████████ actions generate both frontend (starting with ██████████████████ and backend (starting with ██████████ logs, as can be seen in the table, see e.g., ███████████████████████████ and ██████████████████████. I will not speculate as to why there is a slight discrepancy in the number of frontend and backend logs for the ██████████ action in this dataset.

Table 10: Breakdown of logs of relevant actions by retention state in the Sundar Pichai log data (2022/12/09 – 2023/02/14)

50. Table 10 covers the entire Log Period, including after February 8, 2023, when Google changed the default Retention Setting for Google Chat, as I discussed in Section III. To investigate specifically the retention behavior before this change went into place, I also analyzed retention states for the portion of the Log Period before February 8, 2023. Table 11 shows the results for this interval. During this timeframe, **94.2%** of all messages sent and received that are captured in the Log Dataset had the ██████████ field set to ██████████.
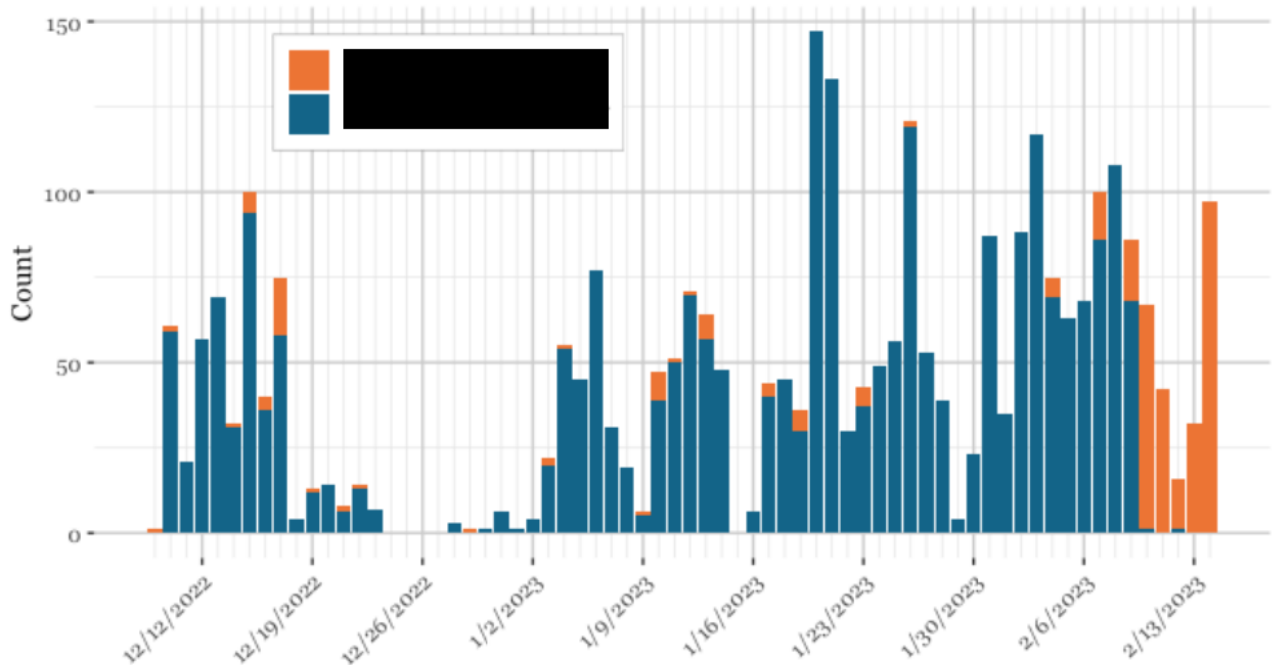
Table 11: Breakdown of logs of relevant actions by retention state in the Sundar Pichai log data (2022/12/09 – 2023/02/07)

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███
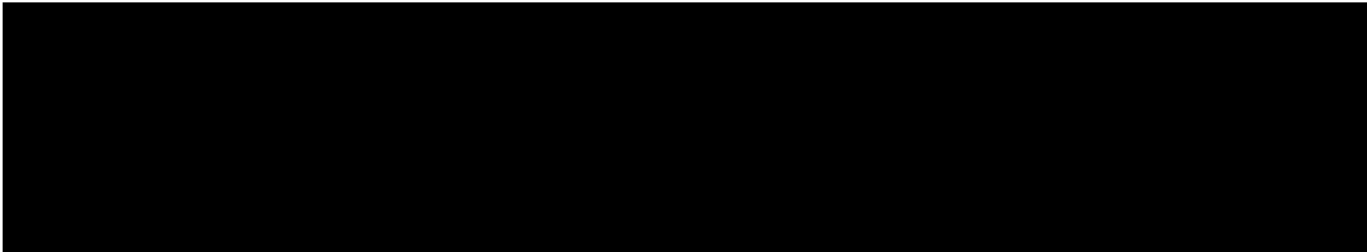
51. Figure 5 shows daily messages sent by Pichai as represented in the Log Dataset, colored by ████████████.[93] For this analysis, I used the counts of backend logs (that is, actions starting with █████████████) in order to avoid double-counting messages due to inclusion of frontend and backend logs. Notably, most messages sent in a day have their ████████████ set to ████████████. Only in the final week of the produced time span does ██████████ become the dominant retention state. As I described in Section III, Google changed the default Retention Setting to "on" on February 8, 2023, coinciding with the sudden switch to ██████████ status in the Log Dataset, as is visible in the switch to orange as the dominant color of the bars at the end of the interval.
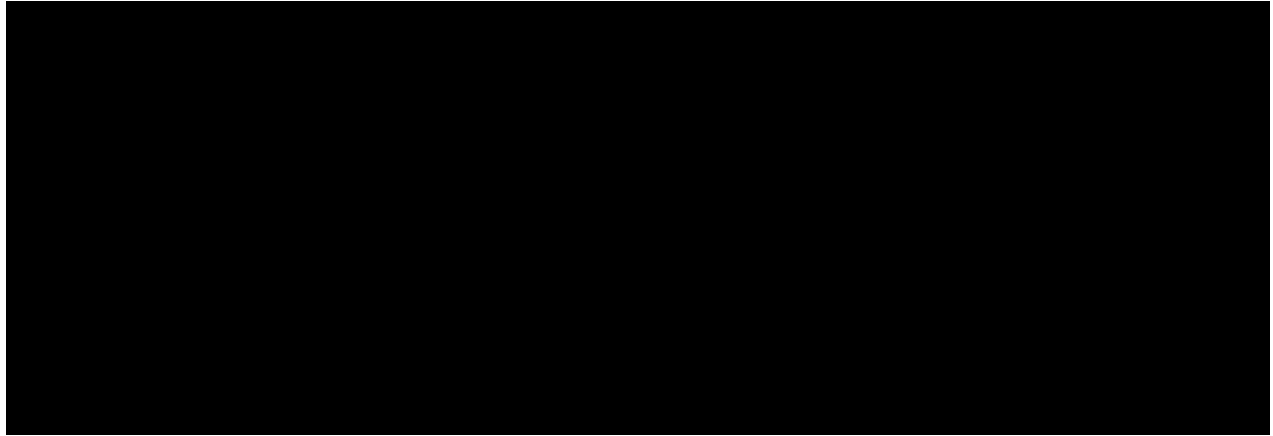
Figure 5: Daily messages sent by Pichai

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[93] The R source code that I used to generate this and the following figures for the other individuals is attached hereto as Appendix D.
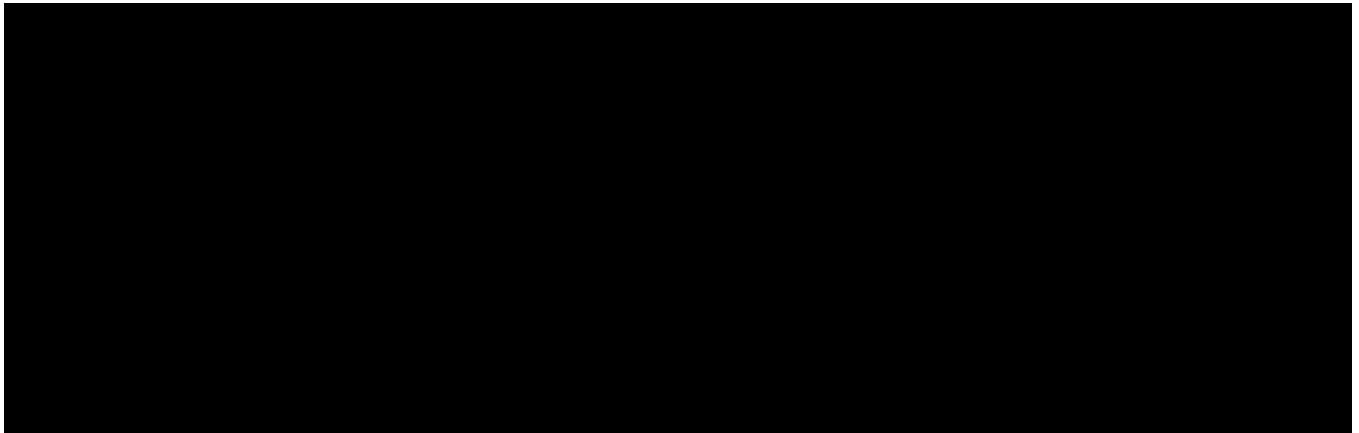
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2. ███████████

52. Table 12 shows the counts of logs for retained and non-retained messages sent by █████ during the Log Period, separated by action type. Almost 90% of the logs have the ████████████ field set to ████████████.

Table 12: Breakdown of logs of relevant actions by retention state in the ██ ████████ log data (2022/12/09 – 2023/02/14)

███

53. Table 13 shows retention state of messages sent and received during the portion of the Log Period before February 8, 2023, when the default Retention Setting was "off." Over 93% of the logs have the ████████████ field set to ████████████.

Table 13: Breakdown of logs of relevant actions by retention state in the Jeff Birnbaum log data (2022/12/09 – 2023/02/07)

███

54. Figure 6 shows daily messages sent by ██████ as represented in the Log Dataset, colored by ████████████. Again, up to the final week, the vast majority of messages in a given day are sent with ████████████ set to ████████████.

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Figure 6: Daily messages sent by ███████

3. ███████████
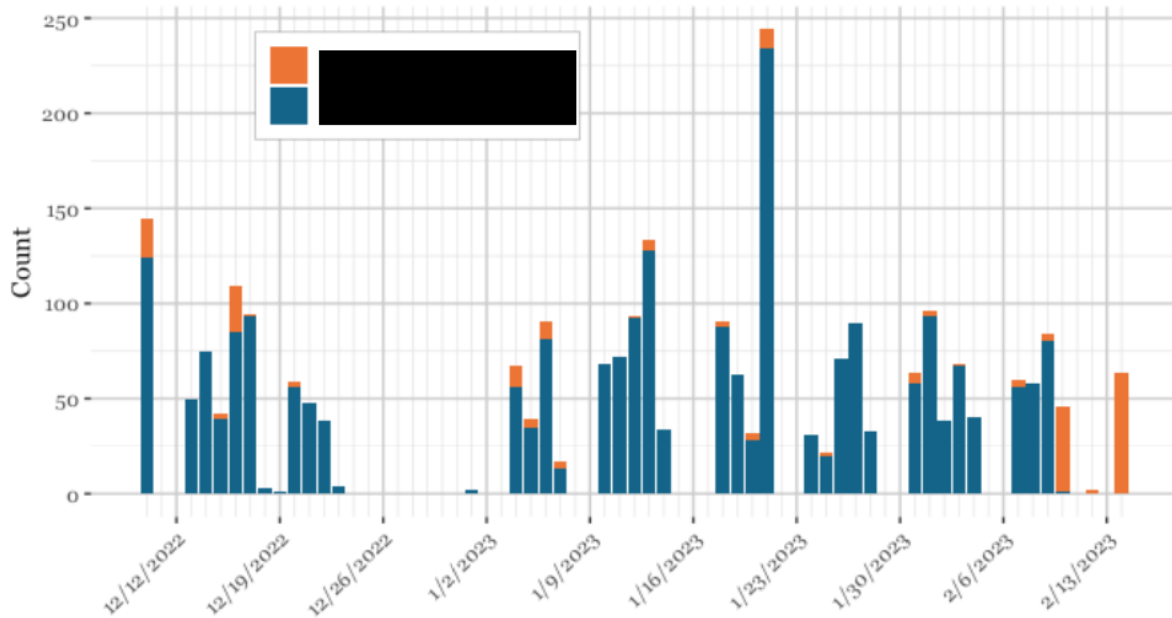
55. Table 14 shows the breakdown of logs for retained and non-retained messages sent by ███████ in the Log Period, separated by action type. Over 95% of the logs have the ███████████████ field set to ████████████████ .

Table 14: Breakdown of logs of relevant actions by retention state in the ████████ **log data (2022/12/09 – 2023/02/14)**

56. Table 15 shows retention state of messages sent and received during the portion of the Log Period before February 8, 2023. Almost 99% of the logs have the ██████████████ field set to ██████████████ .

28

Table 15: Breakdown of logs of relevant actions by retention state in the ████ log data (2022/12/09 – 2023/02/07)

██

57. Figure 7 shows daily messages sent by ████ as represented in the Log Dataset, colored by ████████. Again, up to the final week of the dataset, the vast majority of messages in a given day are sent with ████████ set to ████████. There are two ephemeral actions on the final day in the dataset, both are of type ████████ and do not have an associated ████.

Figure 7: Daily messages sent by ████

4. ████████
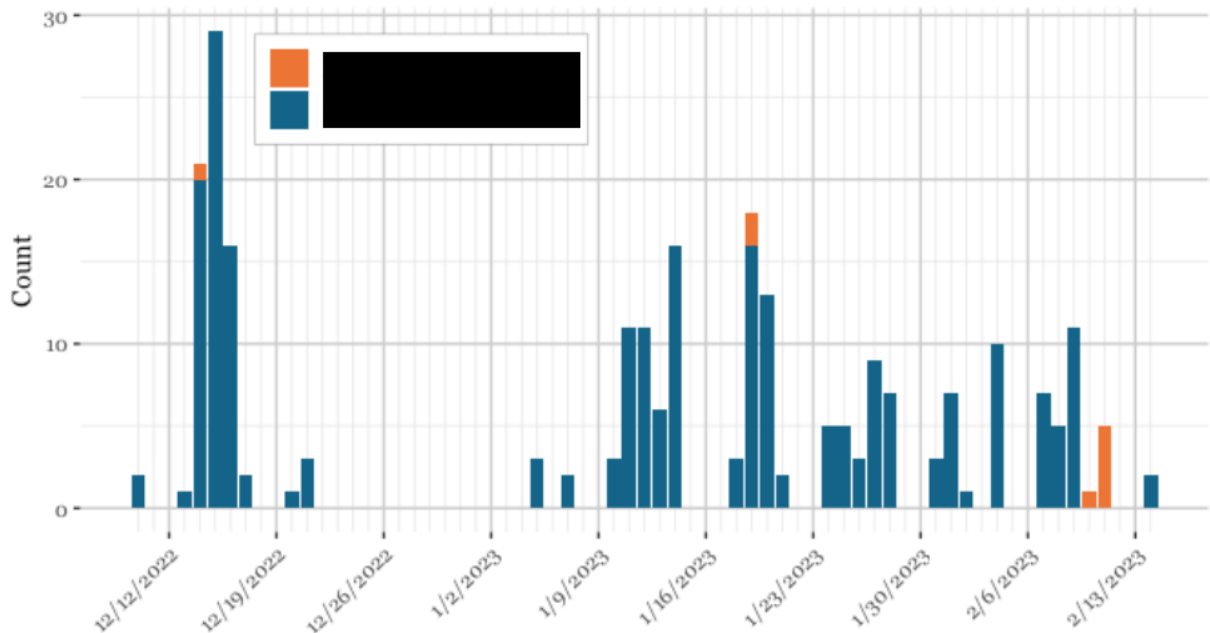
58. Table 16 shows the breakdown of logs for retained and non-retained messages sent by ████ during the Log Period, separated by action type. Around 58% of the log entries (comprising a

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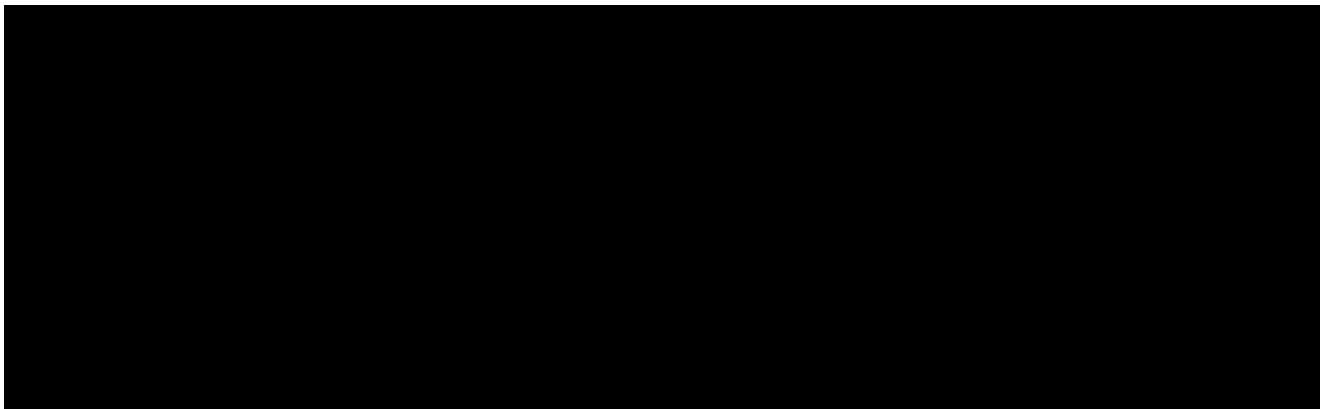
total of only 155 entries in the Log Period, significantly fewer than for the other four individuals) have the ███████████ field set to ███████████.

Table 16: Breakdown of logs of relevant actions by retention state in the ██ ████ log data (2022/12/09 – 2023/02/14)

59. Table 17 shows retention state of messages sent and received by █████ during the portion of the Log Period before February 8, 2023. Approximately 61% of the logs have the ███████████ field set to ███████████.

Table 17: Breakdown of logs of relevant actions by retention state in the ██ ████ log data (2022/12/09 – 2023/02/07)

60. Figure 8 shows daily messages sent by █████ as represented in the Log Dataset, colored by ███████████.

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Figure 8: Daily messages sent by ████████

5. ████████████████████

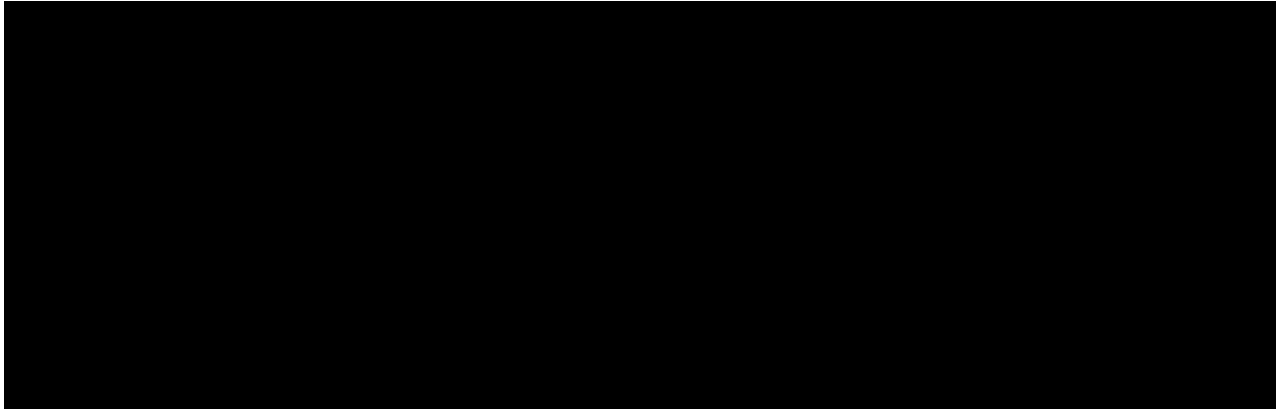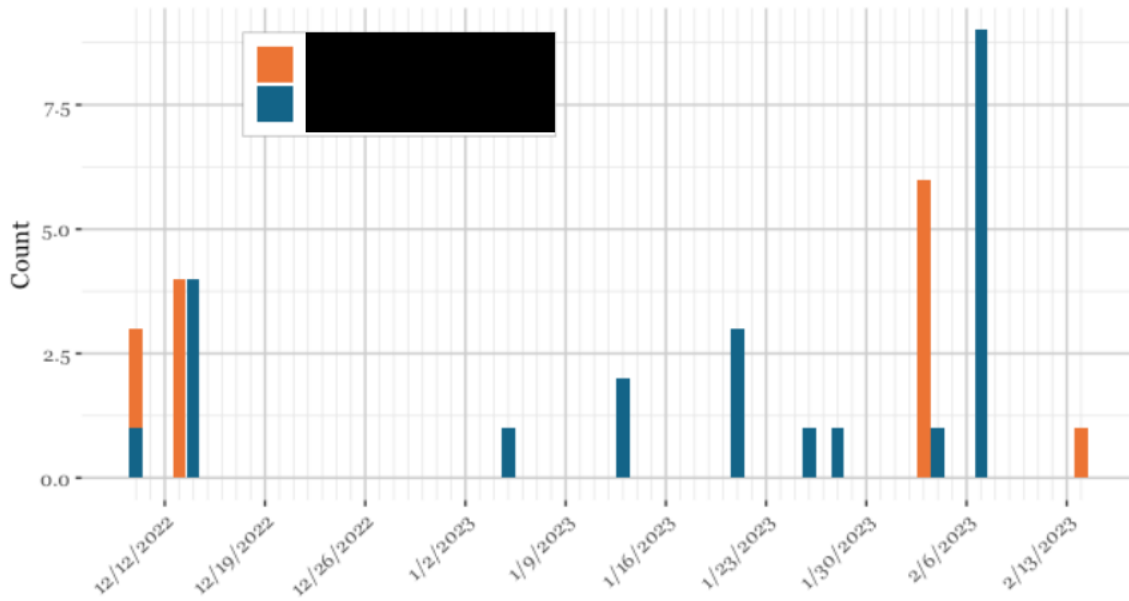61. Table 18 shows the breakdown of logs for retained and non-retained messages sent by ████████ during the Log Period, separated by action type. Over 85% of the logs have the ████████████ field set to ████████████.

Table 18: Breakdown of logs of relevant actions by retention state in the ████████████ **log data (2022/12/09 – 2023/02/14)**

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62. Table 19 shows retention state of messages sent and received during the portion of the Log Period before February 8, 2023. Approximately 93% of the logs have the ▮▮▮▮▮▮▮▮ field set to ▮▮▮▮▮▮▮▮.

Table 19: Breakdown of logs of relevant actions by retention state in the ▮▮▮▮▮▮▮▮ log data (2022/12/09 – 2023/02/07)
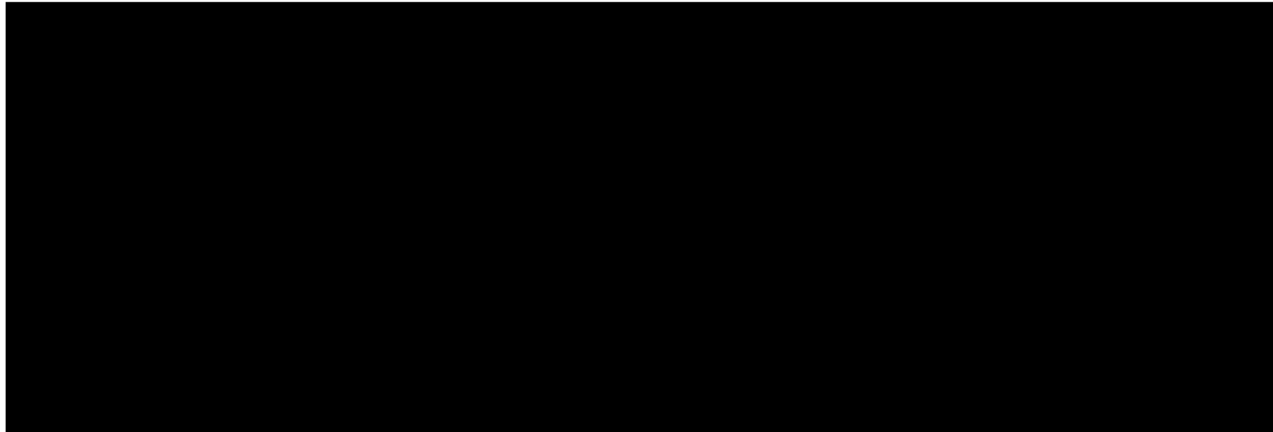
63. Figure 9 shows daily messages sent by ▮▮▮▮▮▮▮▮ per day in the Log Dataset, colored by ▮▮▮▮▮▮▮▮. Again, up to the final week, the vast majority of messages in a given day are sent with ▮▮▮▮▮▮▮▮ set to ▮▮▮▮▮▮▮▮.

Figure 9: Daily messages sent by ▮▮▮▮▮▮▮▮
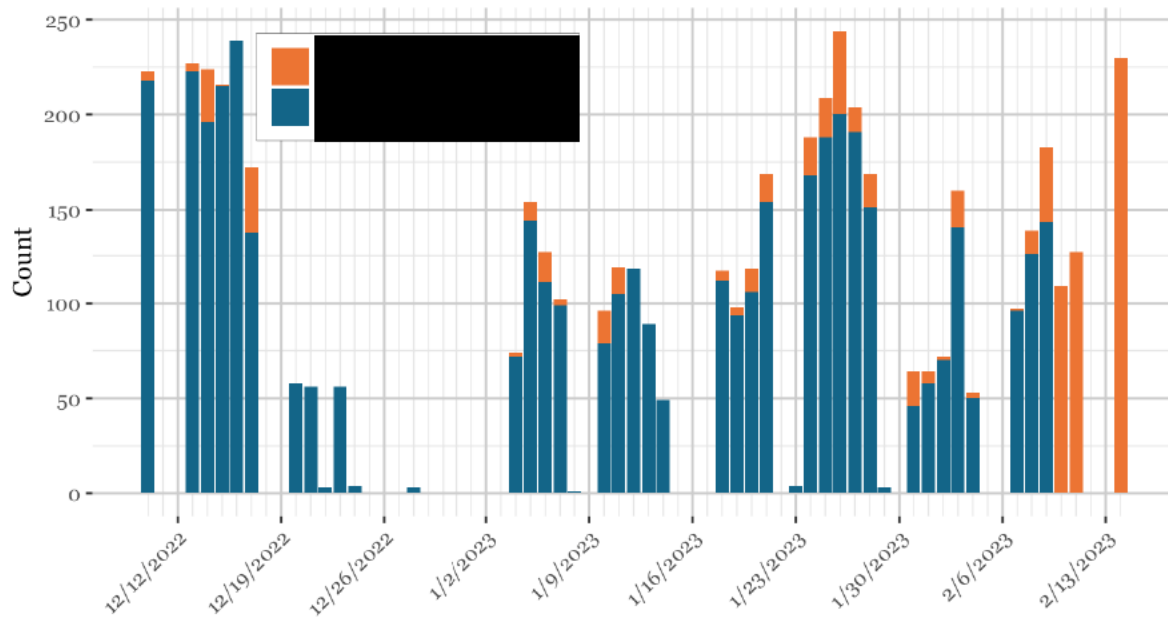
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VI.   ALMOST 90% OF CONVERSATIONS (GROUPS) FOR EACH INDIVIDUAL HAD THE CHAT RETENTION SETTING TOGGLED OFF AT SOME POINT

64. Next, I investigated the ███████████ for the different Groups that the five custodians are members of, and further, how many times the ███████████ for a given Group changes from ████████ to ███████████ in the Log Dataset, indicating that a chat participant toggled the retention history "off". Like Section V, this analysis was also aided by the program (see Appendix C) that I wrote. I found that for over 90% of the Groups involving each of the five individuals, history was "off" at least for some time during the Log Period. When considering only the interval before Google changed the Retention Setting default to "on," this number rises to over 94% of the Groups. I observed no toggle actions by any of the five individuals (which I understand would result in ███████████████████ ███████████████████ actions), but there is evidence for toggle actions by other chat participants, evidenced by changes in the ███████████ in message log entries for a given Group. Finally, I also investigated the Retention Setting for the time period before February 8, 2023, when Google implemented the default of "on," and found that for each individual, at least 90% of Groups had retention "off" for at least some time before February 8, 2023.

65. Table 20 shows different statistics for Groups with retention information. The second column contains the total of unique Groups each individual was a part of. The third column shows how many of these Groups had only ephemeral messages logged for the entirety of the Log Period, showing that this was the case for the vast majority of Groups. The fourth column shows the number of Groups which at least at some point had the Retention Setting turned "off," showing that this was the case for around 90% or more for each individual. The final column gives the number of retention toggles observed (by looking for changes in ███████████ within the message action logs for a given Group, since no toggle actions are present in the dataset, as I discussed in Section V). Overall, few changes in the Retention Setting are observed (and most of the ones that do occur are visible on February 8 or after, indicating that they are due to Google's Retention Setting default switch), indicating that the Retention Setting was largely stationary. I will discuss a notable exception in the following section.

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Table 20: Proportion of Groups for which there is evidence of ephemeral messages and proportion of observed toggles of the Retention Setting

User	Number of unique Groups that the user is part of in Log Dataset	Number (proportion) with only ephemeral messages	Number (proportion) with at least some ephemeral messages	Number (proportion) of Groups for which retention state changed in Log Dataset
▓▓▓▓▓	101	86 (85.1%)	93 (92.1%)	7 (6.9%)
▓▓▓▓▓	41	38 (92.7%)	38 (92.7%)	0 (0%)
Pichai	113	80 (70.8)	102 (90.3%)	22 (19.3%)
▓▓▓▓▓	10	9 (90%)	9 (90%)	1 (9%)
▓▓▓▓▓	175	132 (75.4%)	157 (89.7%)	25 (14.2%)

66. Table 21 demonstrates the number and proportion of Groups each individual participated in that had the Retention Setting set to "off" for the entire time before February 8, 2023, displayed in the third column. In the fourth column, I report the number and proportion of chat groups for which the Retention Setting was set to "off" at some point in time during that interval. There is minimal difference in these two sets of observations (only two instances when the Retention Setting is changed, one in a Group that Pichai is part of, and one in a Group that ▓▓▓▓▓ is part of), showing that for the vast majority (at least 90%) of chat groups each user participated in, no messages were retained during the entire interval up to February 8, 2023.

Table 21: Proportion of unique Groups, prior to 02/08/2023, for which history was "off" for the entire time or was "off" at least once during the interval[94]

User	Number of unique Groups the user participated in before 2/8/2023	Number (proportion) with history "off" for entire time before 2/8/2023	Number (proportion) with history "off" for some amount of time before 2/8/2023
▓▓▓▓▓	94	87 (92.6%)	87 (92.6%)
▓▓▓▓▓	36	35 (97.2%)	35 (97.2%)
Pichai	105	100 (95.2%)	101 (96.2%)
▓▓▓▓▓	10	9 (90%)	9 (90%)

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[94] The column containing number of toggles, as in Table 20, was omitted from this table, since only 2 toggles occurred (one in a Pichai Group, one in a ▓▓▓▓▓ Group).

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| ██████ | 155 | 145 (93.5%) | 146 (94.2%) |

VII.   CHAT MESSAGES PRODUCED IN THIS MATTER WERE AFFECTED BY RETENTION SETTING TOGGLE BEHAVIOR

67. As part of my analysis, I also reviewed chat messages produced in this litigation that are associated with the Groups that appear in the Log Dataset. My goal was to identify logs corresponding to the produced conversations and determine whether any of them had Retention Settings toggled "off" at any point. The latter would indicate that not all messages relevant to this matter were preserved or made available.

68. I analyzed a conversation where one of the participants toggled the Retention Setting "off" in a Group with Sundar Pichai, leading to the loss of hundreds of messages in that Group alone during the Log Period. For several other Groups for which messages were produced, I found that the Retention Setting was "off" at least for portions of the Log Period, resulting in the loss of hundreds of messages in total across these Groups over the course of the Log Period.

69. The first Group I investigated has ██████████████████████ " I reviewed two excerpts of conversations for this Group. First is a conversation between Sundar Pichai and nine other Google employees held between December 8 and 9, 2022, and the second is a short conversation between two other employees in this Group held on December 29, 2022.[95]

70. Figure 10 shows the beginning of the first conversation on December 8, 2022. The subject line starts with "████████████ which is the ████████ that I used to identify the Group in the produced logs.[96]

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[95] Google internal conversation, "████████████████████:2022-12-08T00:21:21.295727", GOOG-AT-MDL-007412389 (HCI); Google internal conversation, "████████████████:2022-12-29T01:34:27.483071", GOOG-AT-MDL-007412395 (HCI).

[96] This space_id appears in both of the log files produced for Sundar Pichai, GOOG-AT-MDL-C-000088210.csv and GOOG-AT-MDL-C-000088211.csv.

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Figure 10: Excerpt from chat messages between Sundar Pichai and 9 other Google employees in the Space with ID "████████████"[97]

Message
_____

From: ████████████████████████
Sent: 12/8/2022 7:21:21 PM
To: ████████████ ████████████████████████████
             ██

Subject: █████████████████ 2022-12-08T00:21:21.295727
Attachments: image.png

•   ████████████████ 2022-12-08T19:21:21.295Z
https://www.washingtonpost.com/technology/2022/12/08/ftc-sues-microsoft-over-activision/
 o   https://www.washingtonpost.com/technology/2022/12/08/ftc-sues-microsoft-over-activision/
•   ████████████████ 2022-12-08T19:21:33.013Z
Brads efforts did not work

71. The Log Dataset begins on December 9, 2022, so the messages seen in Figure 10 are not present in the data. However, I identified logs for several messages seen later in the conversation. Figure 11 shows messages from Sundar Pichai starting at 6:49 UTC on December 9, 2022.

_____

[97] See GOOG-AT-MDL-007412389 at '389 (HCI).

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<u>Figure 11: Excerpt from chat messages between Sundar Pichai and other Google employees in Group with ID "</u> ▮▮▮▮▮▮▮▮ **<u>(highlights added)</u>** [98]
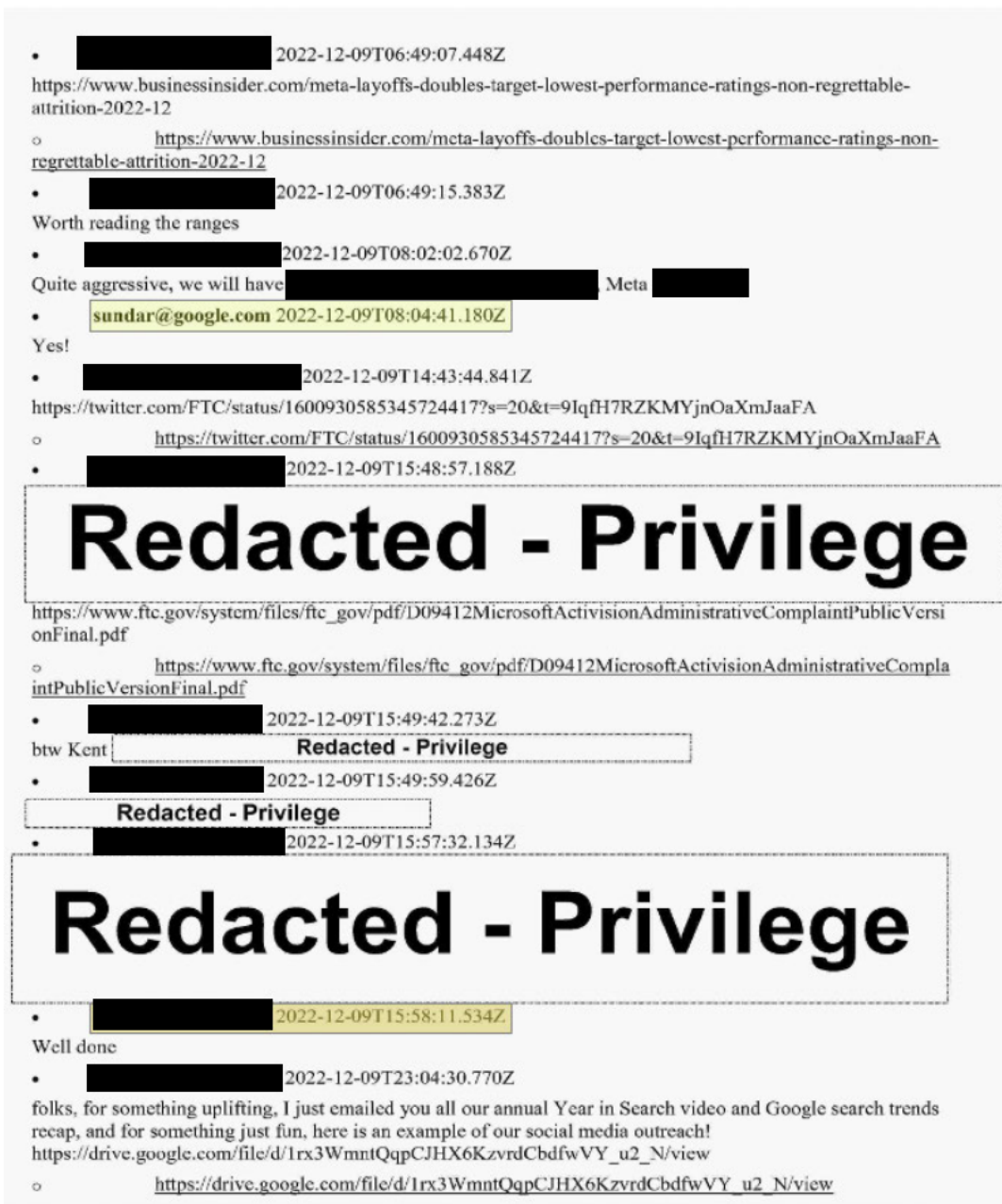
72. The Log Dataset begins at 8:02 UTC that day and contains logs of messages sent and received by Sundar Pichai in this Group from that point onward. <u>Figure 12</u> below shows the available log entries for actions within this Group from December 9, 2022. As expected, since these messages were available for production, the ▮▮▮▮▮▮▮ for all these entries is

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[98] See GOOG-AT-MDL-007412389 at '392 (HCI).

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███████. The message sent by Pichai that is highlighted in yellow is the first message captured in the produced Log Dataset. As I discussed above, the dataset also includes log entries for some of the received messages, captured by the D█████████████████████ action.

Figure 12: Excerpt from Pichai log dataset (processed)

person	action	space_id	retention_sta	epoch
Pichai				12/9/22 8:04:40.909
Pichai				12/9/22 8:04:40.951
Pichai				12/9/22 15:48:58.301
Pichai				12/9/22 15:48:58.302
Pichai				12/9/22 15:48:58.365
Pichai				12/9/22 15:49:43.231
Pichai				12/9/22 15:49:43.266
Pichai				12/9/22 15:49:43.266
Pichai				12/9/22 15:50:00.392
Pichai				12/9/22 15:50:00.400
Pichai				12/9/22 15:50:00.401
Pichai				12/9/22 15:57:33.227
Pichai				12/9/22 15:57:33.231
Pichai				12/9/22 15:57:33.260
Pichai				12/9/22 15:58:11.323
Pichai				12/9/22 15:58:11.367
Pichai				12/9/22 23:04:31.731
Pichai				12/9/22 23:04:31.786
Pichai				12/9/22 23:04:31.787
Pichai				12/9/22 23:05:22.217
Pichai				12/9/22 23:05:22.219
Pichai				12/9/22 23:05:22.223
Pichai				12/9/22 23:56:38.425
Pichai				12/9/22 23:56:38.426
Pichai				12/9/22 23:56:38.458

73. Below is a summary of my observations from analyzing the entries shown in Figure 12.

   a. The first two entries (highlighted in yellow) are the frontend and backend logs for the message sent by Pichai that was also highlighted in yellow in Figure 11 (i.e., first message in this Space captured in this dataset).

   b. Notably, the first response to Pichai's message (by ████████████████ at 2022-12-09 14:43:44.841) does <u>not</u> appear to be present in this dataset. In fact, no other log entries exist for this space from around that time.

   c. The following four messages (from ██████████████████████████ ████████████████████████████████ in order) are logged with three

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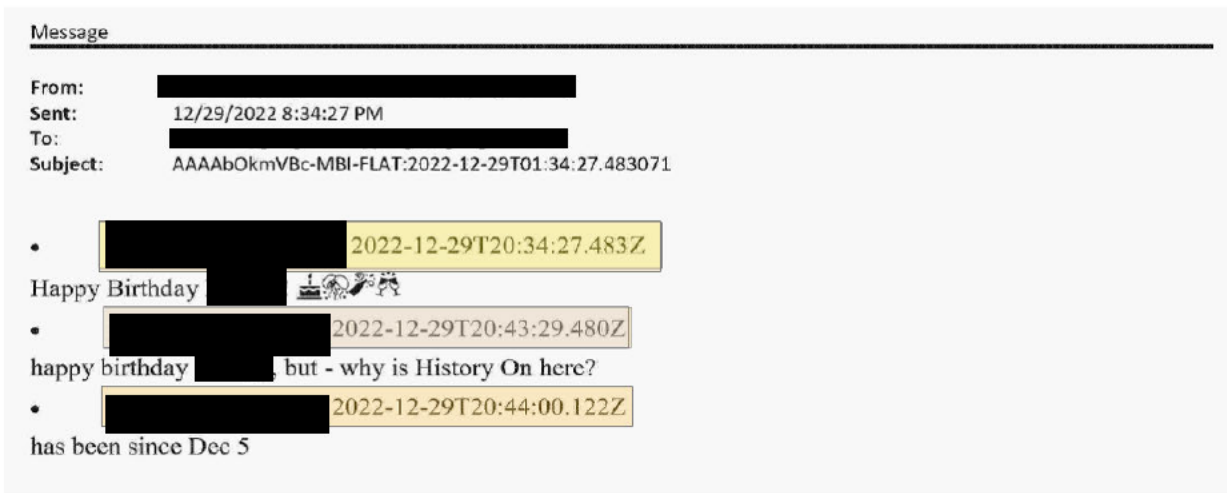██████████████████████████████████████ actions each, which happen within several milliseconds of each other and of the "post" time shown in Figure 11 (these are marked as four bracketed triples on the righthand side of Figure 12). I note that while ██████████████████████████ action logs indicate message notifications received by Pichai, they do not provide any information on the authors of these messages.

    d. The next set of two logs are the frontend and backend log entries for Pichai's reply towards the bottom of Figure 8, highlighted in orange.

    e. The remainder of the responses by other chat participants are all represented by triples of ████████████████████████████ entries.

74. My observations above indicate a valid mapping between the produced conversation and the corresponding backend and frontend logs. In addition, they confirm that (1) messages with ███████████████████████ are retained and can be seen in produced documents and (2) the Log Dataset captures a subset of the messages received by the relevant user.

75. Another produced document contains a short excerpt from the same Group (with the same ID of "████████████ on December 29, 2022, shown in Figure 13. Notably, the second message in the conversation states, "why is History On here?"

Figure 13: Excerpt from chat messages in Space with ID "████████████**"** [99]

Message
From: ████████████████████
Sent: 12/29/2022 8:34:27 PM
To: ████████████████████
Subject: AAAAbOkmVBc-MBI-FLAT:2022-12-29T01:34:27.483071

- ████████████ 2022-12-29T20:34:27.483Z
Happy Birthday ████ 🎂🍰🎈🎉
- ████████████ 2022-12-29T20:43:29.480Z
happy birthday ████, but - why is History On here?
- ████████████ 2022-12-29T20:44:00.122Z
has been since Dec 5

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[99] Google internal conversation, "████████████████████:2022-12-08T00:21:21.295727", GOOG-AT-MDL-007412389 (HCI); Google internal conversation, "████████████████:2022-12-29T01:34:27.483071", GOOG-AT-MDL-007412395 (HCI).

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76. Figure 14 shows the log entries for this Group and date in the Log Dataset. The logs show triples of ███████████████████████ actions for each of these messages (color-coded in shades of orange according to the messages in Figure 13), with ████████████████████. After these three messages, the next entry is another ██████████████████████ action (indicating a message by another chat participant), this time with ████████████ set to ████████████. This indicates that one of the chat participants toggled off the Retention Setting for this Group after the final message visible in Figure 13, and the remainder of the conversation that day (and going forward) was not preserved. Figure 14 shows the remainder of the logs for the day, all ██████████████, which includes one message by Pichai (highlighted in blue). Figure 13 and Figure 14 definitively show that at least 6 messages were sent that day after the toggle, which were not retained.

Figure 14: Excerpt from Pichai log dataset (processed) [100]

person	action	space id	retention state	epoch
Pichai				12/29/22 20:34:28.504
Pichai				12/29/22 20:34:28.508
Pichai				12/29/22 20:34:28.577
Pichai				12/29/22 20:43:30.535
Pichai				12/29/22 20:43:30.538
Pichai				12/29/22 20:43:30.538
Pichai				12/29/22 20:44:01.144
Pichai				12/29/22 20:44:01.195
Pichai				12/29/22 20:44:01.195
Pichai				12/29/22 21:00:38.729
Pichai				12/29/22 21:00:38.765
Pichai				12/29/22 21:00:38.817
Pichai				12/29/22 21:19:59.146
Pichai				12/29/22 21:19:59.148
Pichai				12/29/22 21:19:59.210
Pichai				12/29/22 21:48:29.228
Pichai				12/29/22 21:48:29.238
Pichai				12/29/22 21:48:29.284
Pichai				12/29/22 21:58:08.612
Pichai				12/29/22 21:58:08.615
Pichai				12/29/22 21:58:08.617
Pichai				12/29/22 21:58:49.693
Pichai				12/29/22 21:58:49.746
Pichai				12/29/22 22:24:41.647
Pichai				12/29/22 22:24:41.650
Pichai				12/29/22 22:24:41.688

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[100] This view was generated by filtering on the ████████ field in all_retention_states.xlsx, provided with my report.

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77. My analysis of the logs demonstrates that ███████████ for this Group remains set to ███████████ until February 8, 2023, and is flipped to ████████ for the remainder of the period covered by the dataset. During the time window in which the Retention Setting was "off" (December 29 to February 8), a total of 866 log entries are recorded in the Log Dataset, corresponding to 135 messages sent by Pichai and (at least) 198 messages by other chat participants. This marks 86% of a total of around 387 messages recorded in the Log Dataset for this Group. Consequently, messages relevant to this litigation were lost due to the toggle of the Retention Setting.

78. Several other conversations produced in this case can be linked to individuals and Groups present in the Log Dataset. Although these conversations do not fall within the date range of the Log Dataset, I observe from the logs that these conversations had history toggled "off" for extended periods of time covered by the dataset. Table 22 shows such example Spaces and their date ranges.

Table 22: Example Groups and date ranges from the Log Dataset for which history was toggled off

Bates number	group_id	Date range in produced document
GOOG-AT-MDL-008358088[101]	███████	2/21/23-2/22/23
GOOG-AT-MDL-008358061[102]	███████	2/13/23-2/17/23
GOOG-AT-MDL-008358076[103]	███████	2/13/23-2/15/23
GOOG-AT-MDL-014213973[104]	███████	3/15/23-3/16/23

79. Table 23 shows the number of backend calls ████████████████ for each of the Groups above. It is apparent that each of these Groups had the Retention Setting toggled "off" at some point.

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[101] Google internal conversation, "████████████:2023-02-21T03:13:29.918207," GOOG-AT-MDL-008358088 (CI).

[102] Google internal conversation, "██████████:2023-02-13T00:12:55.179311," GOOG-AT-MDL-008358061 (CI).

[103] Google internal conversation, "██████████:2023-02-13T03:27:40.861519," GOOG-AT-MDL-008358076 (CI).

[104] Google internal conversation, "██████████:2023-03-15T01:36:12.428607," GOOG-AT-MDL-014213973 (CI).

Table 23: Number of backend calls for each example Group listed in Table 22

group_id	User	Number of ephemeral messages sent in Log Dataset	Number of permanent messages sent in Log Dataset
		48	0
		180	37
		3	7
		1	6

80. This indicates that these conversations, which are pertinent to this litigation, were generally impacted by the loss of message history, meaning that relevant past messages were not retained or produced.

VIII. CONCLUSION

81. My analysis of the Log Dataset leads to the following conclusions.

    a. The vast majority of chat conversations, aggregated across all five individuals in the Log Dataset, were entirely ephemeral. The proportion of these chat conversations for which the Retention Setting was "off" for the entire portion of the Log Period before February 8 (i.e., before the Retention Setting default was changed to "on") was **94%**. None of the five individuals personally toggled the chat history "on" for the duration of the Log Period.

    b. As a result, the volume of individual messages lost, that should have been retained, was extremely high. According to my analysis, there were 9,592 messages sent by the individuals represented in the Log Dataset that were lost and at least 8,974 messages received by these individuals that were lost in just this 68-day period across only five individuals (during a holiday period), resulting in a minimum of **18,566** messages lost (of a total of around 21,269 messages logged). For Google's CEO Sundar Pichai, this resulted in the loss of more than **96%** of all chat messages in the interval before February 8, 2023.

    c.   I found that for at least one chat produced in this matter, the Retention Setting was toggled off by one of the participants, resulting in **hundreds of lost messages for a single conversation that was relevant to this litigation**.[105]

82. My analysis leads me to conclude that it is reasonable to assume that the number of messages lost per year, across all employees under the litigation hold, was close to **1.5 million**.[106]

IX.   APPENDIX A: MATERIALS RELIED UPON

A.   Documents from production

1. GOOG-AT-MDL-007412389.pdf

2. GOOG-AT-MDL-007412395.pdf

3. GOOG-AT-MDL-008358061.pdf

4. GOOG-AT-MDL-008358076.pdf

5. GOOG-AT-MDL-008358088.pdf

6. GOOG-AT-MDL-009709520.pdf

7. GOOG-AT-MDL-014213973.pdf

8. GOOG-AT-MDL-018586767.pdf

9. GOOG-AT-MDL-018590555.pdf

10. GOOG-AT-MDL-B-004290479.pdf

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[105] Count of lost messages from Group ██████████

[106] I understand that by the beginning of 2022, 141 Google employees had been placed on litigation hold (Letter from Robert McCallum, August 29, 2024, attached hereto as Exhibit D). Based on an estimated 18,566 messages lost for the 5 individuals represented in the Log Dataset over 68 days, a conservative estimate is that for any given employee, $18,566/(5 \times 68) \times 365 = 19,931$ messages were lost in a given year prior to the change of the retention setting default. This estimate is conservative, since the 68-day period included a popular Holiday period, and one of the individuals included had what appears uncharacteristically low messaging volume. Now, even assuming that *half* of the employees under litigation hold had left the company by 2022, this comes to about $20,000 \times 70 = 1.4$ million messages lost in a single year.

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11. GOOG-AT-MDL-C-000088198.CSV

12. GOOG-AT-MDL-C-000088199.CSV

13. GOOG-AT-MDL-C-000088200.CSV

14. GOOG-AT-MDL-C-000088201.CSV

15. GOOG-AT-MDL-C-000088202.CSV

16. GOOG-AT-MDL-C-000088203.CSV

17. GOOG-AT-MDL-C-000088204.CSV

18. GOOG-AT-MDL-C-000088205.CSV

19. GOOG-AT-MDL-C-000088206.CSV

20. GOOG-AT-MDL-C-000088207.CSV

21. GOOG-AT-MDL-C-000088208.CSV

22. GOOG-AT-MDL-C-000088209.CSV

23. GOOG-AT-MDL-C-000088210.CSV

24. GOOG-AT-MDL-C-000088211.CSV

25. GOOG-AT-MDL-C-000088212.pdf

26. GOOG-DOJ-AT-00932521.pdf

B.   Communications

27. Exhibit A. Email from Robert McCallum, "RE: Texas v. Google: Play Logs," (August 29, 2024).

28. Exhibit B. Email from Veronica Bosco, "RE: Texas v. Google: Play Logs," (September 23, 2024).

29. Exhibit C. Email from Veronica Bosco, "RE: Texas v. Google: Play Logs," (October 1, 2024).

30. Exhibit D. Letter from Robert McCallum, "Re: State of Texas et al. v. Google LLC, No. 4:20-cv-957-SDJ (E.D. Tex.)," (August 29, 2024).

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C.   Public sources

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D.   Deposition Transcripts

1. Deposition of ▮▮▮▮▮▮▮ (May 17, 2024).
2. Deposition of ▮▮▮▮▮ (April 5, 2024).
3. Deposition of ▮▮▮▮▮ (April 12, 2024).
4. Deposition of Nitish Korula, Vol. I (April 19, 2024).

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X.   APPENDIX B: MATERIALS CONSIDERED

A.   Documents from production

1. GOOG-AT-MDL-007373729.pdf
2. GOOG-AT-MDL-007412389.pdf
3. GOOG-AT-MDL-007412395.pdf
4. GOOG-AT-MDL-008150322.pdf
5. GOOG-AT-MDL-008358061.pdf
6. GOOG-AT-MDL-008358076.pdf
7. GOOG-AT-MDL-008358088.pdf
8. GOOG-AT-MDL-009709520.pdf
9. GOOG-AT-MDL-012900020.pdf
10. GOOG-AT-MDL-014213973.pdf
11. GOOG-AT-MDL-018586767.pdf
12. GOOG-AT-MDL-018590555.pdf
13. GOOG-AT-MDL-B-004073824.pdf
14. GOOG-AT-MDL-B-004098902.pdf
15. GOOG-AT-MDL-B-004290479.pdf
16. GOOG-AT-MDL-B-005673865.pdf
17. GOOG-AT-MDL-B-005674120.pdf
18. GOOG-AT-MDL-B-005677190.pdf
19. GOOG-AT-MDL-C-000088198.CSV
20. GOOG-AT-MDL-C-000088199.CSV
21. GOOG-AT-MDL-C-000088200.CSV
22. GOOG-AT-MDL-C-000088201.CSV
23. GOOG-AT-MDL-C-000088202.CSV
24. GOOG-AT-MDL-C-000088203.CSV
25. GOOG-AT-MDL-C-000088204.CSV
26. GOOG-AT-MDL-C-000088205.CSV
27. GOOG-AT-MDL-C-000088206.CSV
28. GOOG-AT-MDL-C-000088207.CSV
29. GOOG-AT-MDL-C-000088208.CSV
30. GOOG-AT-MDL-C-000088209.CSV
31. GOOG-AT-MDL-C-000088210.CSV
32. GOOG-AT-MDL-C-000088211.CSV

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33. GOOG-AT-MDL-C-000088212.pdf

B.   Communications

1. Exhibit A. Email from Robert McCallum, "RE: Texas v. Google: Play Logs," (August 29, 2024).

2. Exhibit B. Email from Veronica Bosco, "RE: Texas v. Google: Play Logs," (September 23, 2024).

3. Exhibit C. Email from Veronica Bosco, "RE: Texas v. Google: Play Logs," (October 1, 2024).

4. Exhibit D. Letter from Robert McCallum, "Re: State of Texas et al. v. Google LLC, No. 4:20-cv-957-SDJ (E.D. Tex.)," (August 29, 2024).

C.   Public sources

1. Bensinger, G. (2023, November 14). Alphabet CEO, in Play store trial, acknowledges some materials not retained. *Reuters*. https://www.reuters.com/technology/alphabet-ceo-play-store-trial-acknowledges-some-materials-not-retained-2023-11-14/. Accessed on September 26, 2024.

2. Google Blog, "The latest on Google Hangouts and the upgrade to Google Chat," (October 15, 2020), https://blog.google/products/workspace/latest-google-hangouts-and-upgrade-google-chat/. Accessed on September 25, 2024.

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4. Google Chat Help, "Get started with Google Chat," https://support.google.com/chat/answer/7653601?hl=en&ref_topic=7649316&sjid=15698590992998824646-EU. Accessed on September 24, 2024.

5. Google Chat Help, "Learn about Spaces," https://support.google.com/chat/answer/7659784?hl=en-GB. Accessed on September 25, 2024.

6. Google Support, "Turn chat history on or off for users," Historical web page retrieved via Wayback Machine. https://web.archive.org/web/20201112005112/https://support.google.com/a/answer/7664184. Accessed on September 30, 2024.

7. Google Workspace, "How to: Turn history on or off in Google Chat," (June 10, 2022), https://www.youtube.com/watch?v=TGzxrWpj1zk. Accessed on September 27, 2024.

8. Google Workspace, https://workspace.google.com. Accessed on September 30, 2024.

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9. IBM, "Remote Procedure Call", https://www.ibm.com/docs/en/aix/7.3?topic=concepts-remote-procedure-call. Accessed on September 25, 2024.

10. Thomson Reuters, "Glossary: Litigation Hold," https://uk.practicallaw.thomsonreuters.com/9-501-9293?transitionType=Default&contextData=(sc.Default). Accessed on September 25, 2024.

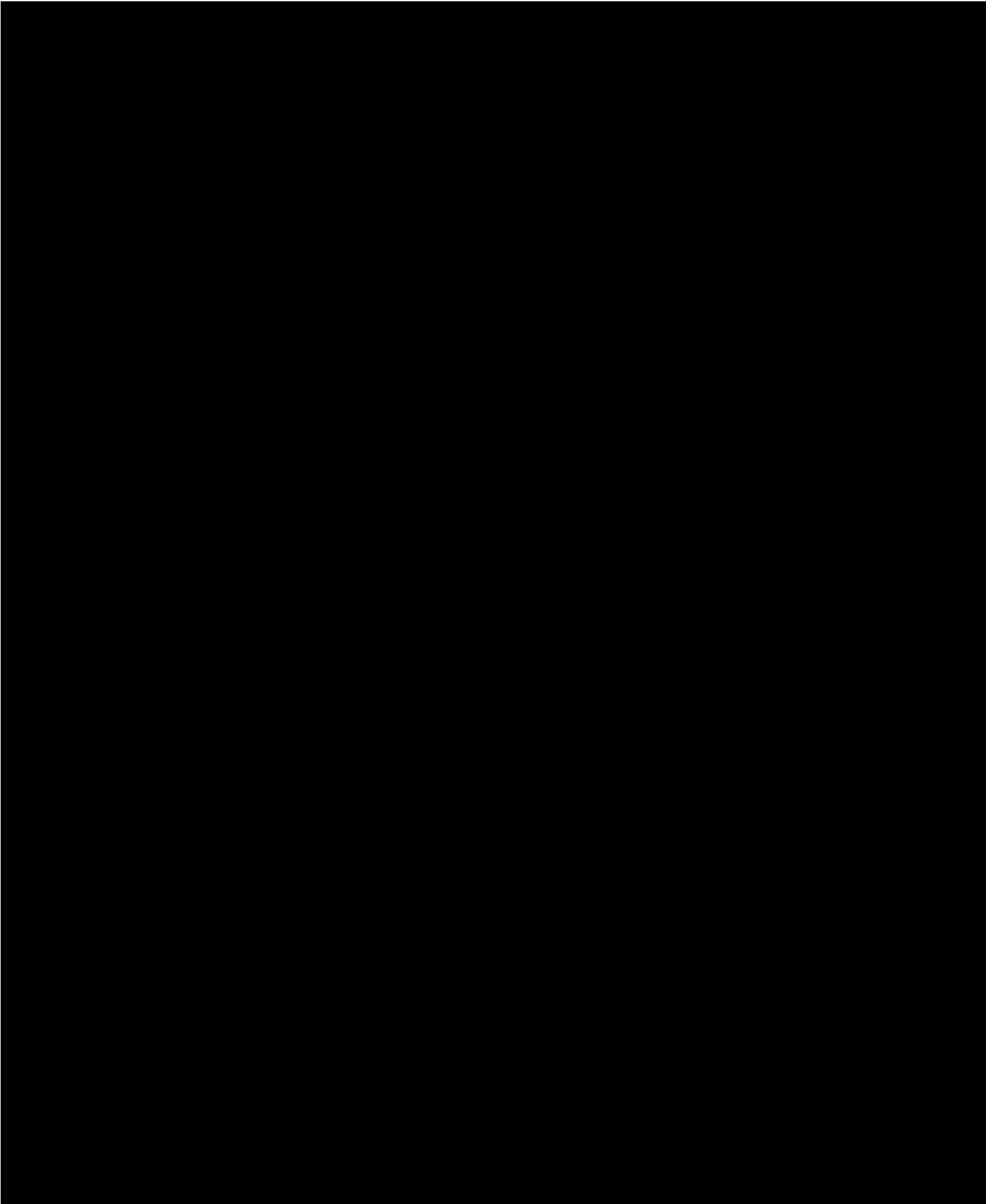### D.   Deposition Transcripts

1. Deposition of ▮▮▮▮▮▮▮ (May 17, 2024).
2. Deposition of ▮▮▮▮▮ (April 5, 2024).
3. Deposition of ▮▮▮▮▮ (April 12, 2024).
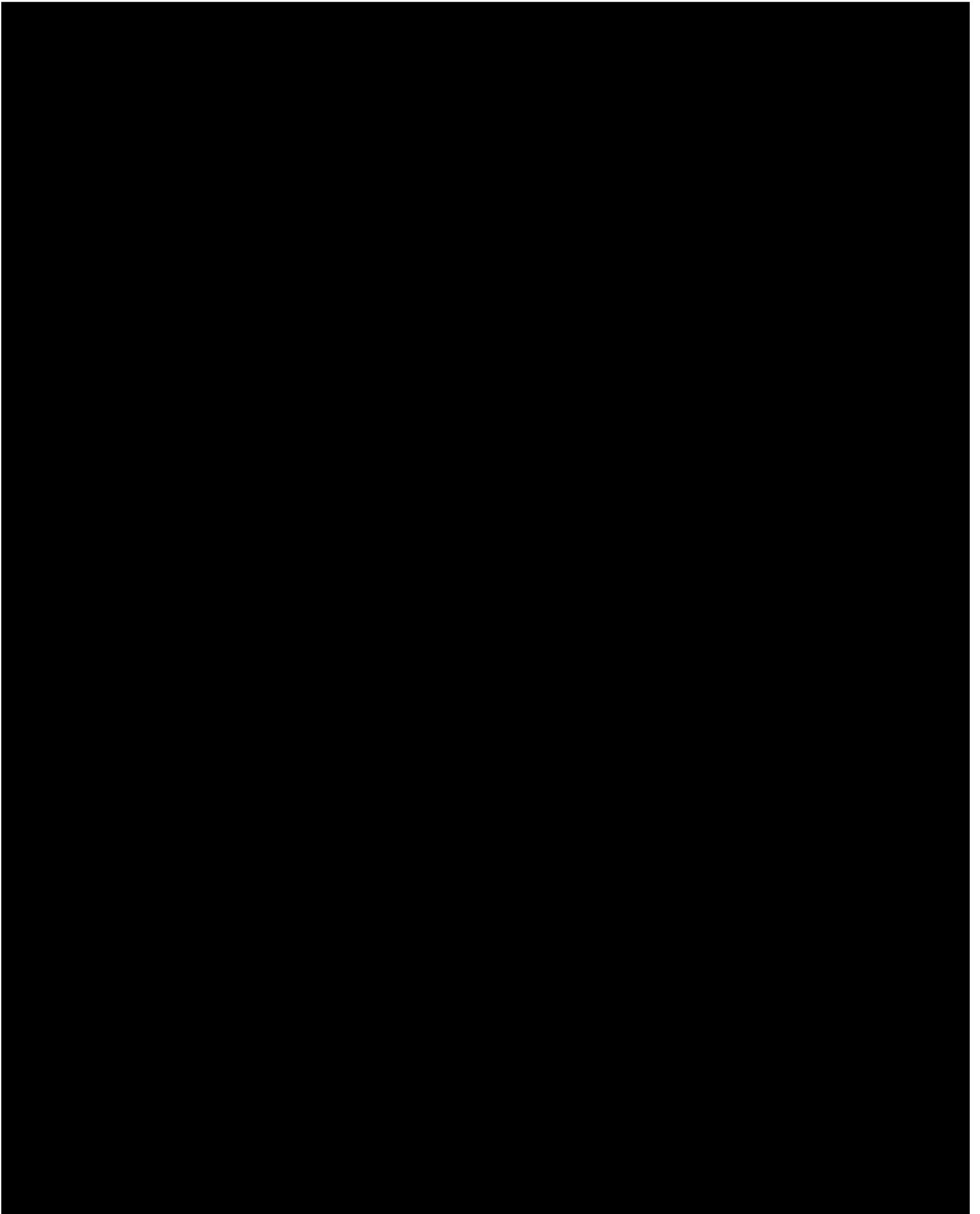4. Deposition of Nitish Korula, Vol. I (April 19, 2024).

XI.   APPENDIX C: SOURCE CODE FOR ANALYSIS
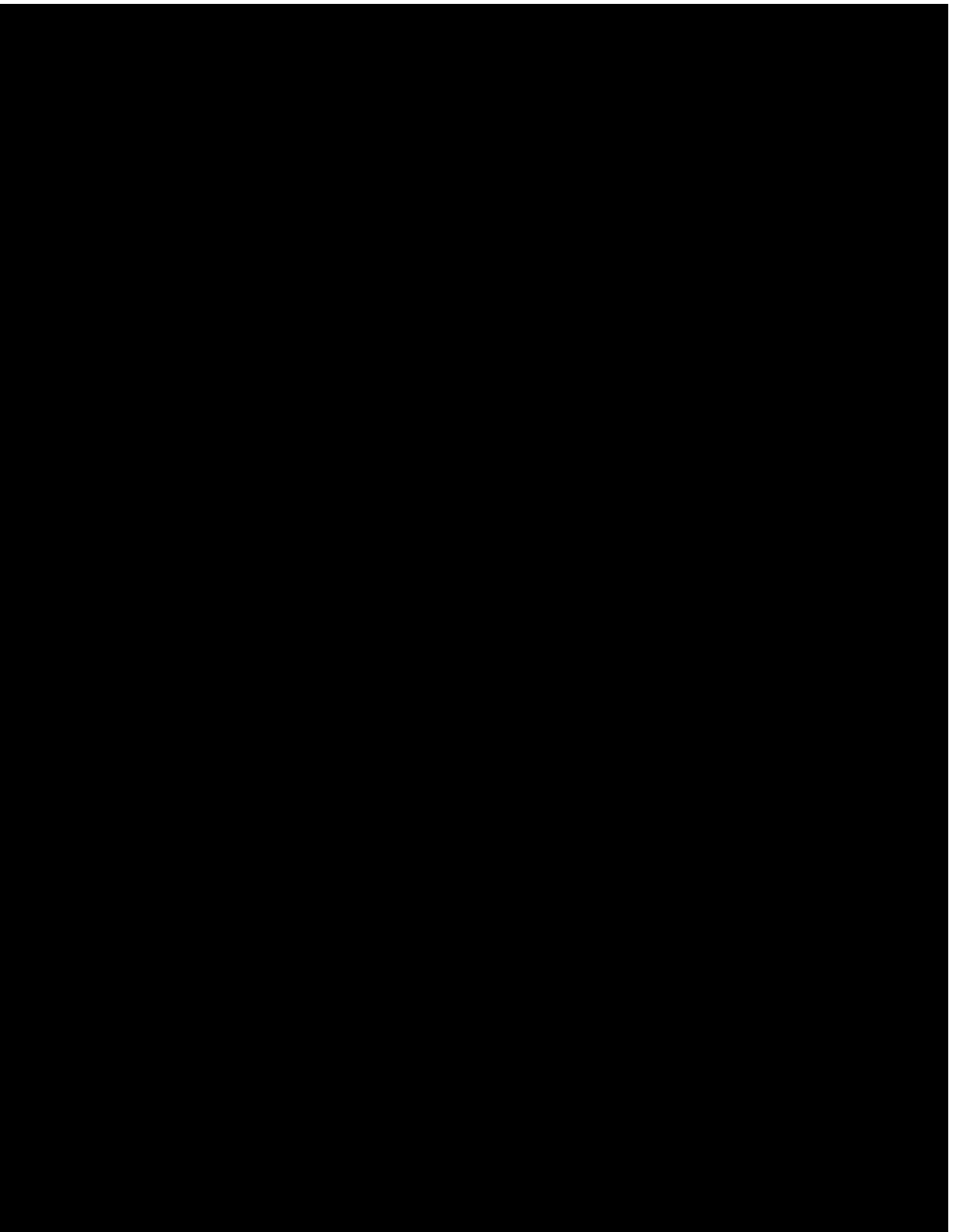
[DOCUMENT STARTS ON THE FOLLOWING PAGE]
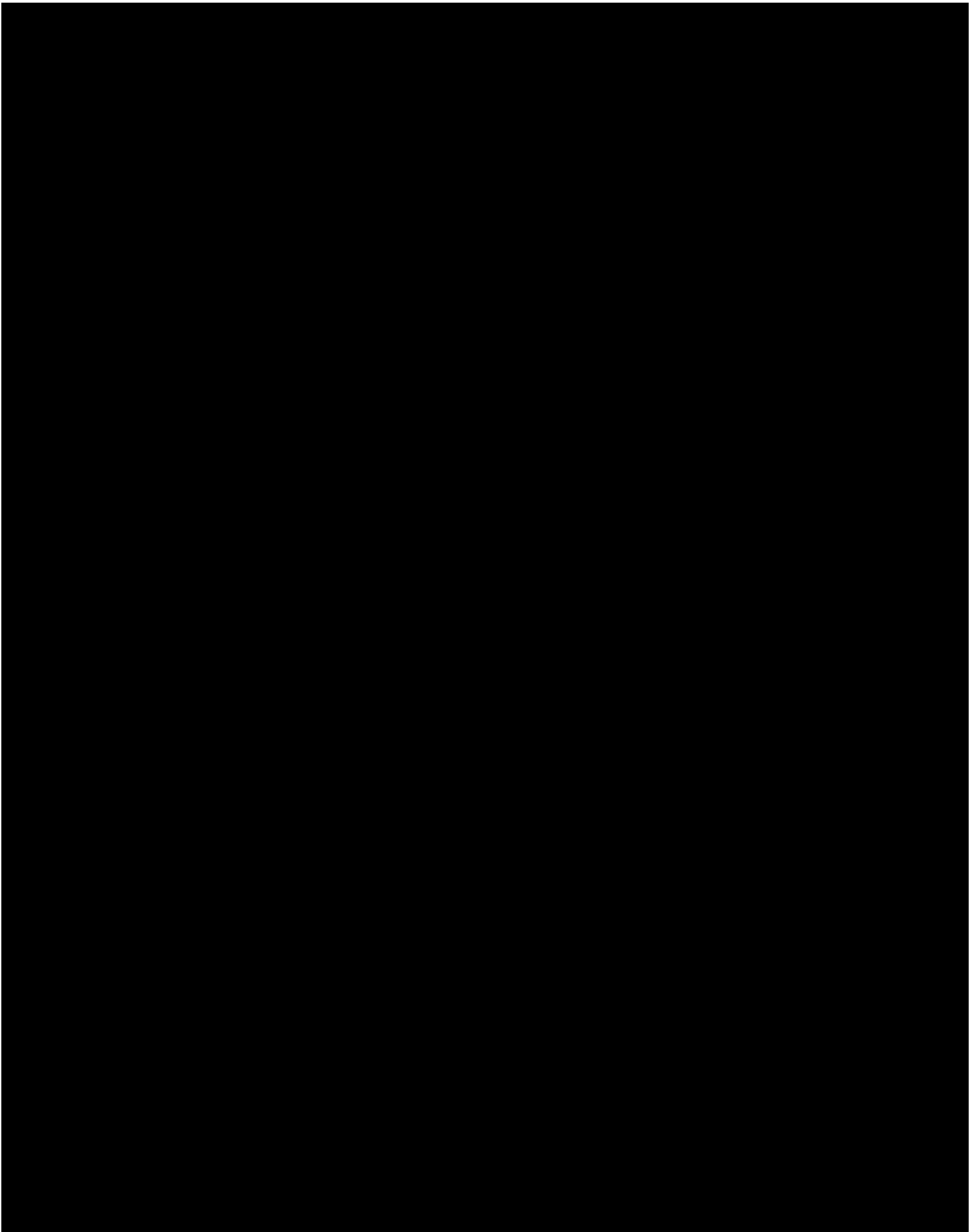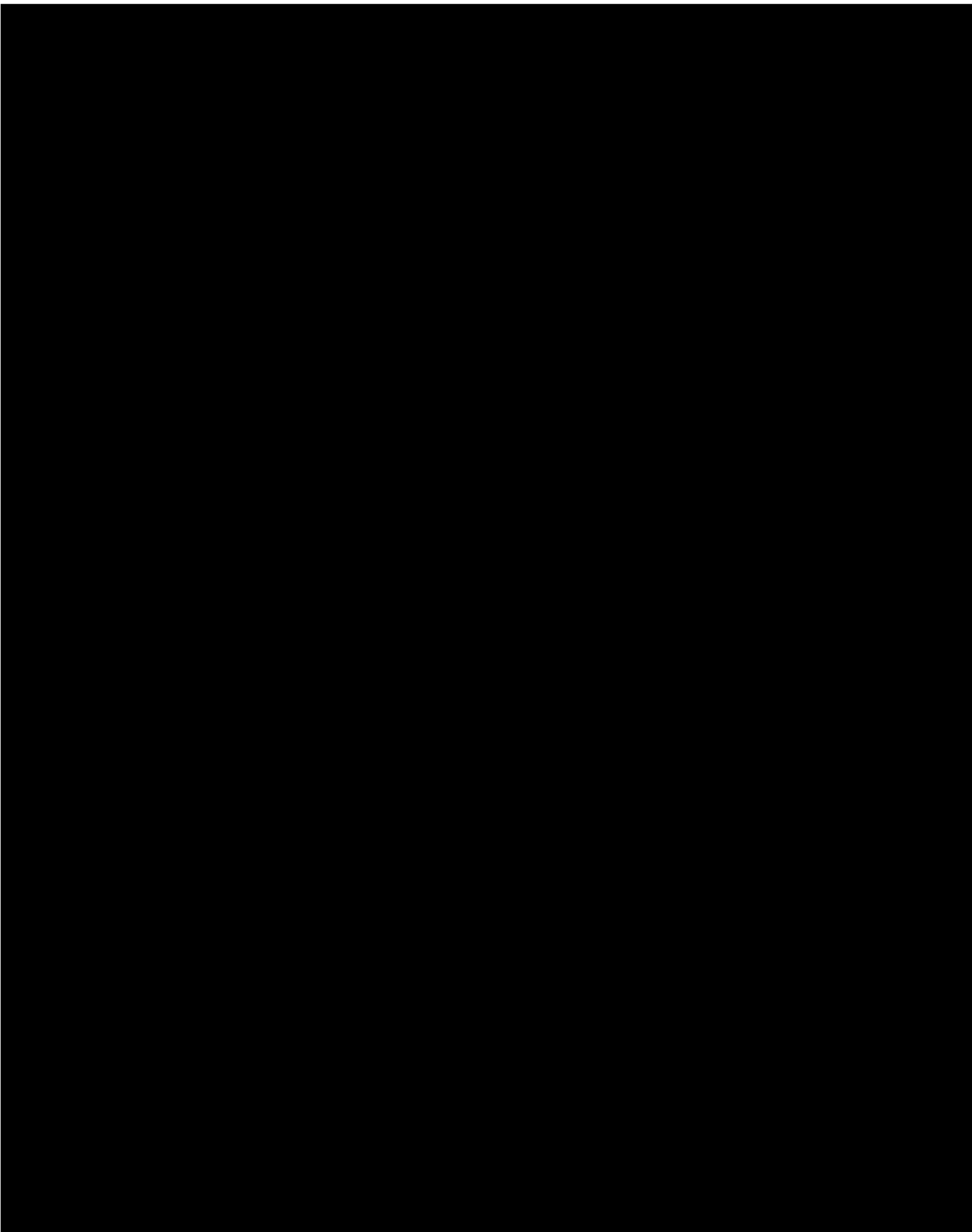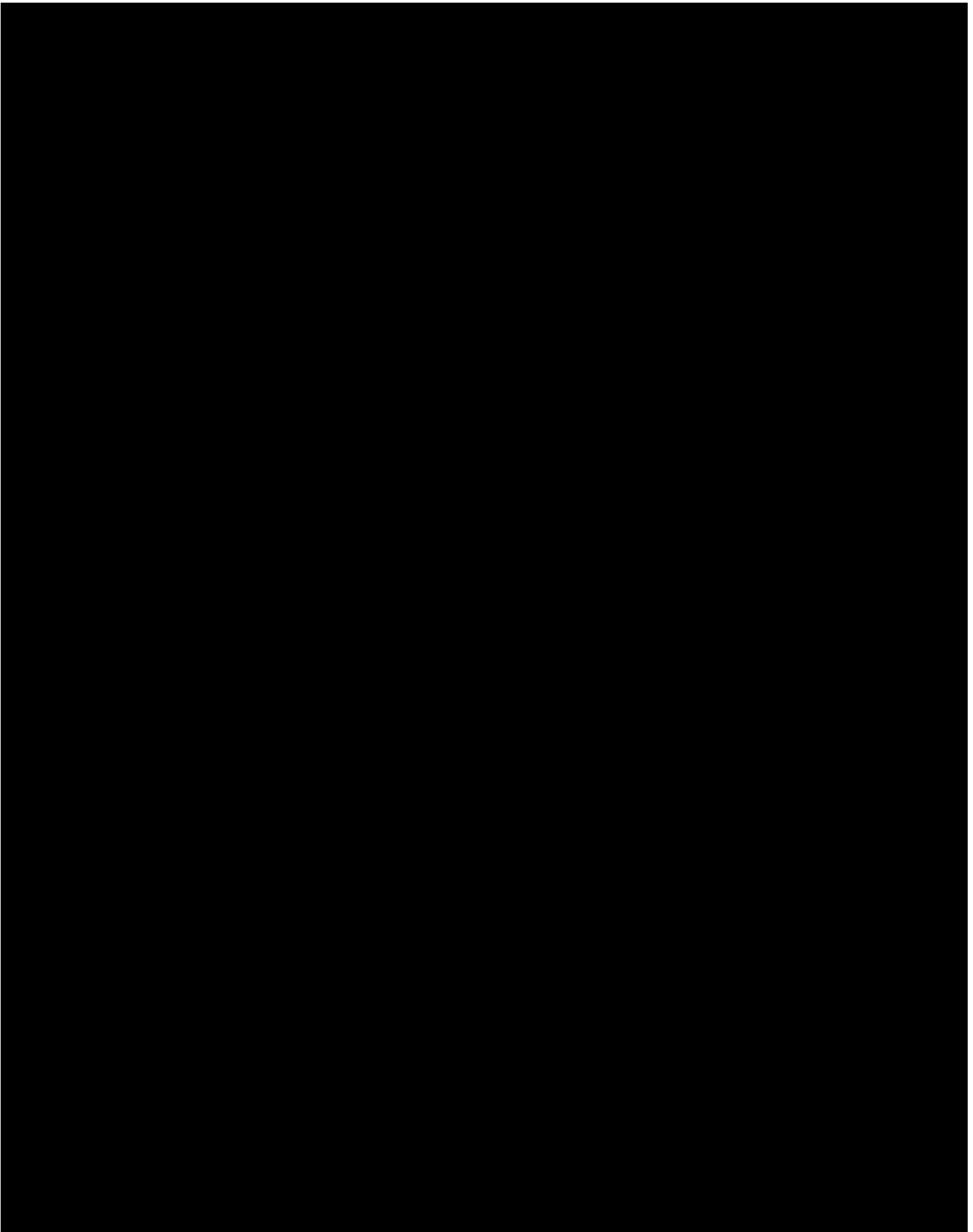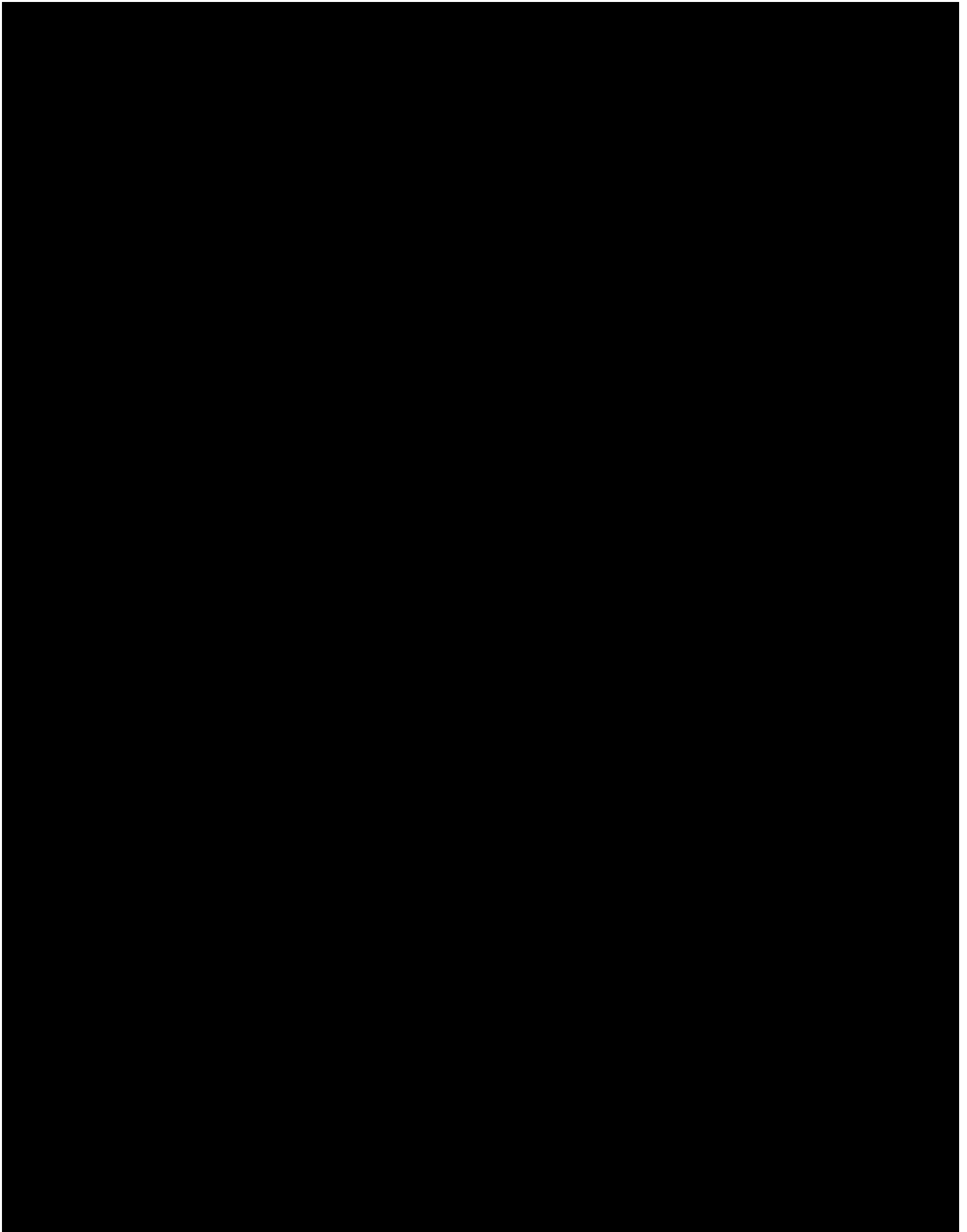
XII.   APPENDIX D: SOURCE CODE FOR BAR CHARTS

[DOCUMENT STARTS ON THE FOLLOWING PAGE]
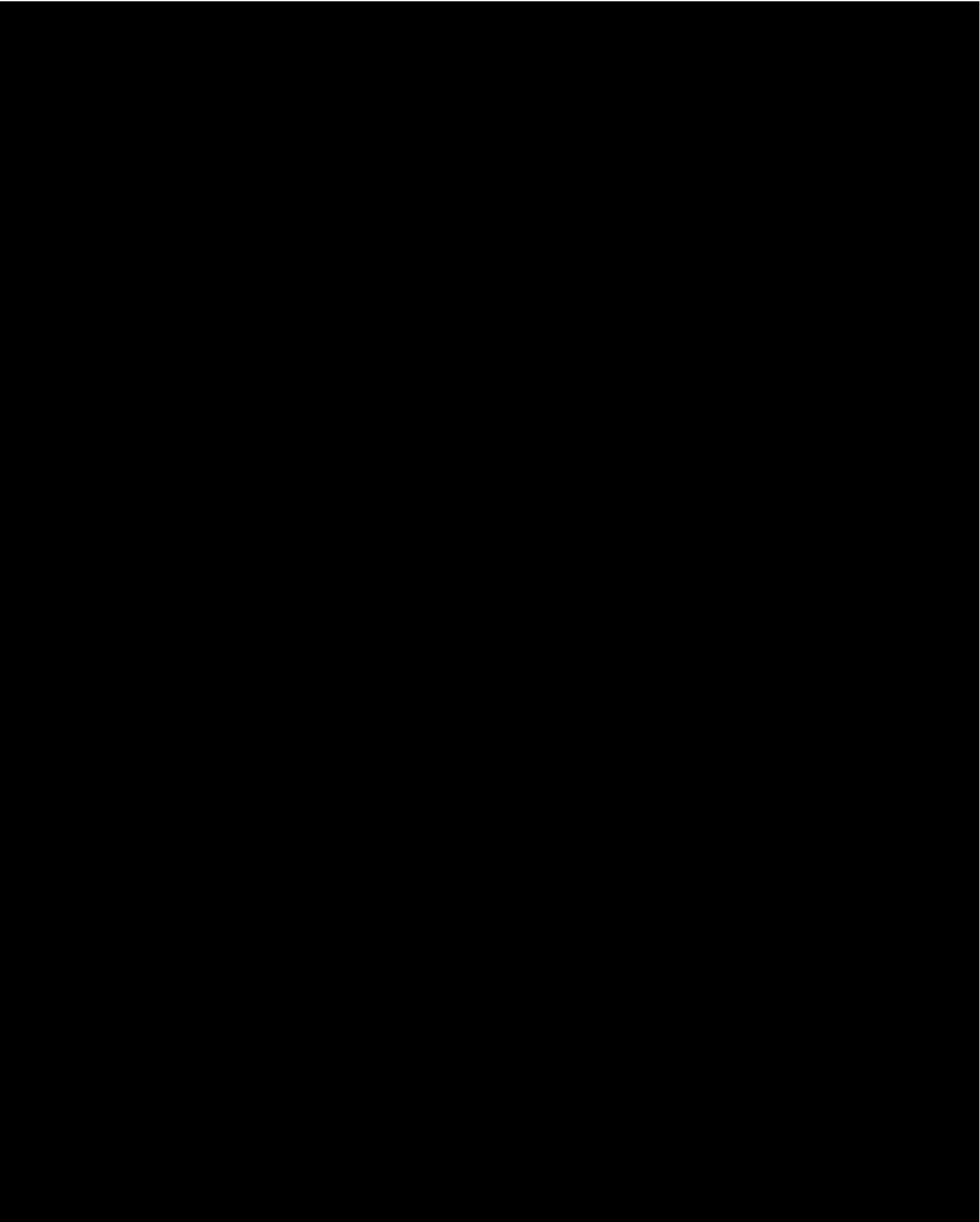
Exhibit A

From:	MCCALLUM, Robert <rob.mccallum@freshfields.com>
Sent:	Thursday, August 29, 2024 2:17 PM
To:	Ethan Glenn; crosson@gibbsbruns.com; BARTON, Robert
Cc:	'mark.lanier@lanierlawfirm.com'; Zeke DeRose III; Alex Abston; Geraldine W. Young; Marc B. Collier; Kathy Patrick; KLEIN, Gayle (GRK)
Subject:	RE: Texas v. Google: Play Logs

Ethan,

Thanks for your email regarding Google's production of an extract of the *Play* logs.

There are no "deficiencies and gaps" in that production. We have produced what we were ordered to produce by the Special Master, as narrowed by our subsequent agreement. In that regard, we note that the Special Master emphasized that their production would present no burden to Google. ECF No. 558 at 13 ("[B]ecause this evidence readily exists in an already-produced form—as it was produced in Play—the Special Master finds that the system-wide backend logs from Play are proportionate and free from any burden to Google."). For the agreed overlapping custodians, Google has produced logs that reflect the same data that was extracted for the *Play* case.

The explanatory documents that Google produced and which you noted in your email — containing a "List of Log Fields," "List of Action Types," and "List of Actions" — were prepared in connection with the *Play* case. Consistent with the Special Master's order, we have provided that same information to you.

While under no obligation to do so, in the interest of cooperation, we have made a good faith attempt to respond to your questions. But in some cases, we are unable to provide the information you have requested on 24 hours' notice. For reasons we are available to discuss, given the nature and age of the logs, the reasoning behind specific log entry choices from over a year ago would be difficult to reconstruct.

Kind regards,
Rob

[GOOGLE'S RESPONSES TO PLAINTIFFS' QUESTIONS FOLLOW]

1. Please confirm that the "timestamp" log field shows time in UDT. If it does not, please identify the correct time zone.

    Google response: Your email references UDT time but we do not know what that means. As explained in the letter accompanying our production, the timestamp field is in unix time. Unix-encoded timestamps map to UTC time.

2. Many logged actions do not have a "███████." What does that mean for the action when the "███████" is missing?

   Google response: We are unable to provide the information you have requested on 24 hours' notice. For reasons we are available to discuss, given the nature and age of the logs, the reasoning behind specific log entry choices from over a year ago would be difficult to reconstruct.

3. Some actions have the ████████████████ marked as ████████. Others do not have it marked at all. What does it mean for the action if that is missing?

Google response: This refers to whether a user may be sent a notification. For reasons we are available to discuss, given the nature and age of the logs, the reasoning behind specific log entry choices from over a year ago would be difficult to reconstruct.

4. Please provide definitions for the following terms, all of which appear in the logs but do not appear in the produced lists:

    a.
    b.
    c.
    d.
    e.
    f.
    g.
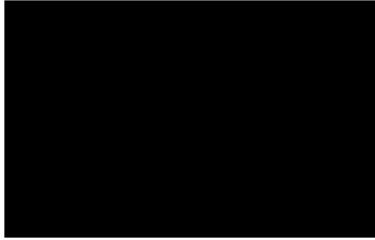
Google response: As noted above, and consistent with the Special Master's Order, we have provided you with the same explanations that were provided in the Play case. It is not feasible to provide additional explanations on Plaintiffs' requested timeline of 24 hours.

5. Please confirm that the "▮▮▮▮▮" identifies the Chat Conversation the action is occurring in or for.

Google response: Confirmed.

6. Please confirm that the "▮▮▮▮▮▮▮" refers to the History setting of the specific identified Chat Conversation at the time the action occurred and was logged. If it does not, please explain what it means.

Google response: Confirmed.

7. Please confirm that the "▮▮▮▮▮▮ retention state means that the identified Chat Conversation's History setting at the time the action occurred and was logged was "History On." If it does not, please explain what it means.

Google response: Confirmed.

8. Please confirm that the "▮▮▮▮▮▮▮▮▮" retention state means that the identified Chat Conversation's History setting at the time the action occurred and was logged was "History Off." If it does not, please explain what it means.

Google response: Confirmed.

9. The "List of Log Fields" defines "▮▮▮▮ to mean "▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮." Please confirm that each Google employee only has one "▮▮▮." If employees have more than one "▮▮▮" please provide each "▮▮▮ for the five custodians which Google produced Chat logs for.

Google response: The production cover letter accompanying the logs identified which logs relate to which users by Bates stamp.

Exhibit B

From:	BOSCO, Veronica <Veronica.Bosco@freshfields.com>
Sent:	Monday, September 23, 2024 9:23 AM
To:	Ethan Glenn; mark.lanier@lanierlawfirm.com; Zeke DeRose III; Alex Abston; Geraldine W. Young; Marc B. Collier
Cc:	rob.mccallum; crosson@gibbsbruns.com; BARTON, Robert; kpatrick@gibbsbruns.com; gayle.klein
Subject:	RE: Texas v. Google: Play Logs

Good morning Ethan, Marc,

Thanks for speaking the other day. As discussed, we are following up with respect to your questions 2 and 4 regarding the *Play* logs.

Definitions:
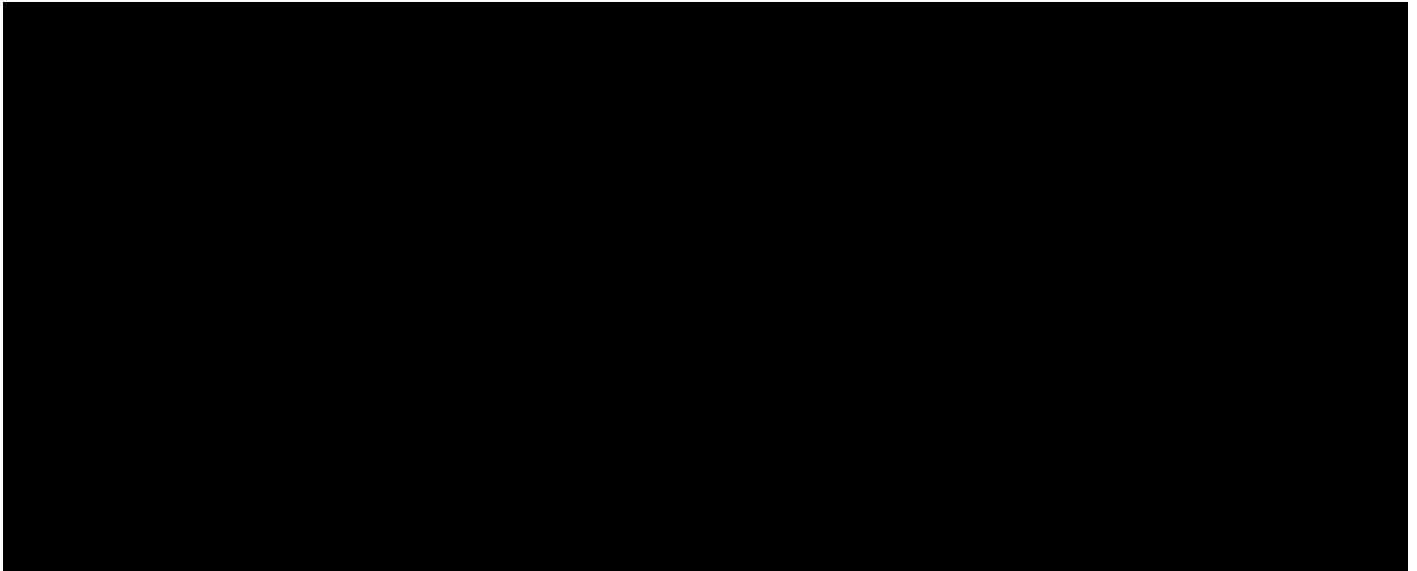
Missing ▮▮▮▮▮▮:

As we explained during our meet and confer, there are several reasons why a "▮▮▮▮▮▮" might be missing for a logged action. For example, "▮▮▮▮▮▮" is not logged for actions that are specific to a user, but aren't associated with a specific space. One such action would be fetching the Chat's world view, i.e., reading all spaces for a specific user.

We wish to reiterate that gathering this information has already presented a burden to Google not contemplated by the Special Master's Order, and we trust that Plaintiffs have now received sufficient information regarding this production.

Kind regards,
Veronica

Exhibit C

From:	BOSCO, Veronica <Veronica.Bosco@freshfields.com>
Sent:	Tuesday, October 1, 2024 12:53 PM
To:	Ethan Glenn; mark.lanier@lanierlawfirm.com; Zeke DeRose III; Alex Abston; Geraldine W. Young; Marc B. Collier
Cc:	rob.mccallum; crosson@gibbsbruns.com; BARTON, Robert; kpatrick@gibbsbruns.com; gayle.klein
Subject:	RE: Texas v. Google: Play Logs

Ethan,

We have followed up with Google regarding your request. As previously noted, these are internal logs for debugging purposes. The logs operated as intended and ████████ values were not logged for all actions, such as actions that are specific to a user but not associated with a specific space. In that scenario, there is no ████████ because there is no specific space associated with the action. Additionally, since this log is a debugging log, a "████████" might not have been logged if it was not necessary for debugging purposes. So there is nothing to recover and it does not make sense that the data would be available elsewhere.

Best,
Veronica

From: Ethan Glenn <ethan.glenn@nortonrosefulbright.com>
Sent: Monday, September 23, 2024 10:59 AM
To: BOSCO, Veronica <Veronica.Bosco@freshfields.com>; mark.lanier@lanierlawfirm.com; Zeke DeRose III <zeke.derose@lanierlawfirm.com>; Alex Abston <Alex.Abston@LanierLawFirm.com>; Geraldine W. Young <geraldine.young@nortonrosefulbright.com>; Marc B. Collier <marc.collier@nortonrosefulbright.com>
Cc: MCCALLUM, Robert <rob.mccallum@freshfields.com>; crosson@gibbsbruns.com; BARTON, Robert <Robert.Barton@freshfields.com>; kpatrick@gibbsbruns.com; KLEIN, Gayle (GRK) <Gayle.Klein@freshfields.com>
Subject: RE: Texas v. Google: Play Logs

Good morning Veronica,

Thank you for the responses. Regarding the missing ████████; during our meet & confer on Sept. 13, Google stated it would look into whether the missing ████████ existed elsewhere/were recoverable or whether they were permanently missing/unrecoverable. Was Google able to determine that answer?

Regards,

Ethan Glenn | Counsel
Norton Rose Fulbright US LLP
98 San Jacinto Boulevard, Suite 1100, Austin, Texas 78701-4255, United States
Tel +1 512 536 2437 | Fax +1 512 536 4598
ethan.glenn@nortonrosefulbright.com

NORTON ROSE FULBRIGHT

Law around the world
nortonrosefulbright.com

Exhibit D

Freshfields Bruckhaus Deringer US LLP

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Via Email

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August 29, 2024

Re: *State of Texas et al. v. Google LLC*, No. 4:20-cv-957-SDJ (E.D. Tex.)

Counsel:

We write further to our letter dated July 10, 2024 which set forth, in Appendix A, the dates on which custodians in this action were placed on legal hold. Following a manual review, we recently identified that Appendix A mistakenly did not list in many instances the earliest date on which each custodian received a legal hold.

Appendix A to this letter contains a corrected chart that provides the earliest date on which a legal hold notice related to ad tech was issued to each custodian. For custodians who departed Google before they were placed on hold, Appendix A lists the date on which they were placed on hold.

Sincerely,

/s/ Robert J. McCallum

Robert J. McCallum

Appendix A

Custodian Name	Date Originally Provided	Corrected Date
█████████████	February 3, 2021	February 3, 2021
	June 2, 2020	June 2, 2020
	February 3, 2021	February 3, 2021
	January 22, 2021	August 6, 2020
	June 22, 2020	June 23, 2020
	December 5, 2019	December 5, 2019
	January 22, 2021	March 5, 2020
	May 25, 2023	May 25, 2023
	August 4, 2023	August 4, 2023
	January 22, 2021	March 5, 2020
Jonathan Bellack	October 4, 2019	October 4, 2019
Brad Bender	October 4, 2019	October 4, 2019
█████████████	January 18, 2023	November 19, 2020
	September 20, 2022	September 20, 2022
	January 22, 2021	December 10, 2019
	January 22, 2021	March 5, 2020
	October 4, 2019	October 4, 2019
	January 22, 2021	December 10, 2019
	February 3, 2021	February 3, 2021
Per Bjorke	January 29, 2020	January 30, 2020
█████████████	June 22, 2020	June 23, 2020
	May 25, 2023	May 25, 2023
Alejandro Borgia	September 20, 2023	September 20, 2023
█████████████	January 22, 2021	December 10, 2019
	January 22, 2021	December 10, 2019
	March 26, 2024	March 26, 2024
	August 4, 2023	January 30, 2020
	August 4, 2023	August 4, 2023
	February 3, 2021	February 3, 2021

Custodian Name	Date Originally Provided	Corrected Date
	January 22, 2021	March 5, 2020
	February 3, 2021	February 3, 2021
	January 22, 2021	January 30, 2020
	June 22, 2020	June 22, 2020
	June 12, 2023	June 12, 2023
	January 22, 2021	December 10, 2019
Sam Cox	October 4, 2019	October 4, 2019
	February 3, 2021	February 3, 2021
	September 20, 2022	September 20, 2022
	October 16, 2023	February 13, 2020
	January 18, 2023	February 23, 2023
	January 22, 2021	December 10, 2019
	January 22, 2021	December 10, 2019
	January 22, 2021	December 10, 2019
	January 22, 2021	December 10, 2019
	August 4, 2023	August 4, 2023
	August 4, 2023	November 19, 2020
	January 22, 2021	December 10, 2019
	January 22, 2021	January 30, 2020
	August 4, 2023	August 4, 2023
	February 3, 2021	February 3, 2021
	January 22, 2021	June 23, 2020
	January 22, 2021	June 23, 2020
	January 22, 2021	March 5, 2020
	June 22, 2020	June 2, 2020
	July 26, 2023	July 26, 2023
	February 3, 2021	February 3, 2021
	January 22, 2021	June 23, 2020
	January 22, 2021	January 30, 2020
	September 26, 2023	September 25, 2023

Custodian Name	Date Originally Provided	Corrected Date
███████████	January 22, 2021	January 30, 2020
███████████	October 4, 2019	October 4, 2019
███████████	August 6, 2020	August 6, 2020
███████████	January 29, 2021	January 29, 2021
███████████	March 26, 2024	April 4, 2024
███████████	March 26, 2024	April 4, 2024
███████████	January 18, 2023	February 23, 2023
███████████	October 4, 2019	October 4, 2019
███████████	August 4, 2023	November 19, 2020
Nirmal Jayaram	January 22, 2021	June 23, 2020
███████████	June 12, 2023	June 12, 2023
███████████	January 22, 2021	March 5, 2020
███████████	January 22, 2021	March 5, 2020
███████████	February 21, 2020	March 5, 2020
███████████	October 4, 2019	October 4, 2019
███████████	August 4, 2023	August 4, 2023
███████████	January 22, 2021	December 10, 2019
███████████	January 22, 2021	June 23, 2020
███████████	January 22, 2021	October 4, 2019
███████████	February 3, 2021	February 3, 2021
███████████	May 25, 2023	May 25, 2023
███████████	February 4, 2020	February 4, 2020
Nitish Korula	October 4, 2019	October 4, 2019
███████████	February 10, 2021	February 10, 2021
███████████	June 2, 2020	June 2, 2020
███████████	January 22, 2021	December 10, 2019
███████████	September 25, 2023	September 25, 2023
Chris LaSala	January 22, 2021	October 4, 2019
██████	January 22, 2021	August 6, 2020
George Levitte	January 22, 2021	June 23, 2020
█████	January 22, 2021	June 23, 2020

Custodian Name	Date Originally Provided	Corrected Date
Eisar Lipkovitz	June 22, 2020	June 22, 2020
	February 23, 2023	July 12, 2021
	January 22, 2021	June 23, 2020
	August 4, 2023	August 4, 2023
	January 22, 2021	June 23, 2020
	January 22, 2021	March 5, 2020
	July 26, 2023	July 26, 2023
	January 22, 2021	March 5, 2020
	February 3, 2021	February 3, 2021
	May 3, 2023	July 12, 2021
	January 22, 2021	June 23, 2020
Neal Mohan	April 27, 2023	December 10, 2019
Jessica Mok	February 23, 2023	April 28, 2021
	August 4, 2023	August 4, 2023
	January 22, 2021	January 30, 2020
	February 3, 2021	February 3, 2021
	March 8, 2021	March 8, 2021
	February 3, 2021	June 23, 2020
	July 26, 2023	July 26, 2023
	January 22, 2021	June 23, 2020
	June 14, 2023	June 14, 2023
	June 12, 2023	June 12, 2023
	January 22, 2021	June 23, 2020
	July 26, 2023	July 26, 2023
Aparna Pappu	January 22, 2021	October 4, 2019
	September 20, 2022	September 20, 2022
	January 22, 2021	December 10, 2019
	October 16, 2023	October 16, 2023
	January 22, 2021	October 4, 2019
	January 22, 2021	December 20, 2019
	March 26, 2024	April 4, 2024

Custodian Name	Date Originally Provided	Corrected Date
Sundar Pichai	October 4, 2019	October 4, 2019
	January 22, 2021	January 30, 2020
	February 3, 2021	February 3, 2021
	June 22, 2020	June 23, 2020
	October 4, 2019	October 4, 2019
	November 4, 2019	November 4, 2019
	February 3, 2021	February 3, 2021
	January 22, 2021	June 23, 2020
	May 23, 2023	May 23, 2023
	June 12, 2023	April 28, 2021
	January 12, 2022	January 13, 2022
	January 18, 2023	February 23, 2023
	January 22, 2021	January 22, 2021
	January 22, 2021	March 5, 2020
	January 22, 2021	March 5, 2020
	May 25, 2023	November 19, 2020
	August 4, 2023	August 4, 2023
	December 20, 2019	January 30, 2020
	March 8, 2021	March 8, 2021
	January 29, 2021	January 29, 2021
Philipp Schindler	October 4, 2019	October 4, 2019
	October 4, 2019	October 4, 2019
	January 22, 2021	June 23, 2020
	January 22, 2021	July 14, 2020
	January 22, 2021	July 13, 2020
Scott Sheffer	February 3, 2021	December 10, 2019
	January 22, 2021	January 30, 2020
	March 3, 2022	March 3, 2022
	May 23, 2023	May 23, 2023
	January 22, 2021	December 10, 2019
	January 22, 2021	June 23, 2020

Custodian Name	Date Originally Provided	Corrected Date
███████████	January 22, 2021	September 17, 2020
	August 4, 2023	August 4, 2023
	January 22, 2021	March 5, 2020
	August 4, 2023	November 19, 2020
	June 12, 2023	June 12, 2023
Scott Spencer	January 22, 2021	December 10, 2019
████████	January 22, 2021	March 5, 2020
Rahul Srinivasan	January 22, 2021	October 4, 2019
███████████	January 22, 2021	December 10, 2019
	October 4, 2019	October 4, 2019
	January 22, 2021	January 30, 2020
	January 22, 2021	October 4, 2019
	January 22, 2021	January 30, 2020
	June 12, 2023	June 12, 2023
	February 23, 2021	February 3, 2021
	January 22, 2021	December 10, 2019
	June 14, 2023	June 14, 2023
	February 3, 2021	February 3, 2021
	August 4, 2023	August 4, 2023
	January 22, 2021	October 4, 2019
	June 12, 2023	June 12, 2023
	June 12, 2023	June 12, 2023
	January 22, 2021	March 5, 2020
	January 22, 2021	December 10, 2019
	March 3, 2022	March 3, 2022
	January 22, 2021	December 10, 2019
	January 18, 2023	January 18, 2023
	May 25, 2023	May 25, 2023
	January 22, 2021	December 10, 2019
	February 3, 2021	February 3, 2021
	January 22, 2021	July 14, 2020

Custodian Name	Date Originally Provided	Corrected Date
███████████	January 22, 2021	October 4, 2019
███████████	January 22, 2021	March 5, 2020
███████████	January 22, 2021	January 30, 2020
Susan Wojcicki	October 4, 2019	October 4, 2019
███████	October 4, 2019	October 4, 2019