Scientific Working Group on Digital Evidence

Video and Audio Redaction Guidelines

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1. Purpose

Redaction is the intentional removal or concealment of information in a multimedia recording. The purpose of this document is to provide guidance for redaction of digital recordings and associated data, which may include video, audio, and metadata streams. The application of redactions may include, but are not limited to, video recorded by body worn cameras, in-car video systems, digital video recorder systems, 9-1-1 phone calls, jail calling services, crime scene video, and video evidence collected during an investigation.

As with paper documents, it is common for an organization to redact confidential information, content graphic in nature, or information safeguarded by privacy provisions prior to release outside the organization.

2. Scope

This document is intended for use by practitioners with a basic understanding of digital video and audio concepts. It is limited to redaction of digital video and/or audio content that must be withheld. This document addresses reasons for redaction, overview of software, redaction forms, filters, documentation, and workflow.

3. Limitations

Practitioners redacting video and audio should have a basic understanding of video and audio software editing principles. This document is not intended to be an exhaustive guide for personnel who do not have experience editing video and audio. It does not address the forensic analysis of video and audio. See S*WGDE Best Practices for Digital Forensic Video Analysis* [11] and *SWGDE Best Practices for Forensic Audio* [12] for further information.

Any specific software examples included or software vendors listed are meant solely to be illustrative, not exhaustive, and are not endorsements or recommendations.

This document does not adequately cover the application of public disclosure laws and the interpretation of regulatory information. The determination of what needs to be redacted should be made in consultation with legal representatives or personnel trained on the release of records.

When referring to the requestor/submitter throughout this document, it is not intended to address the public requestor.

4. Terminology

- **Redaction** – For purposes of this document, redaction means the intentional removal or concealment of information in a digital video and/or audio recording. This can apply to video, audio, image, or metadata file content.
- **Filter** – A software tool used to add, change, or distort the perception of audio or video. A filter, when applied creates an effect, however, in most software the terms “effect” and “filter” are used interchangeably. For the purposes of this document, the term filter is used.

- **Mask** – A software feature that is used to apply an effect, filter, or transition to a specific region in a multimedia recording.
- **Keyframe** – For purposes of this document, a keyframe is a marked frame or point within the timeline of a multimedia recording that indicates changes to the parameters of an applied effect, filter, or transition.
- **Requestor/Submitter –** The individual or organization requesting redaction.
- **Practitioner –** The individual applying the audio or video redaction methodology.

5. Reason for Redaction

Organizations release multimedia recordings for a variety of reasons. These include, but are not limited to, the following:

- Increased transparency
- Freedom of Information Act or another open records request
- Public dissemination for safety alert or assistance with suspect identification
- Use in research
- Use in criminal prosecution or civil litigation
- Judge's ruling or court order

Prior to release, an organization may have to redact information contained within a recording. Most often redaction is necessary to maintain the privacy of individuals or to comply with regulations and laws governing the protection of sensitive identifiable information. This may include, but is not limited to:

- To comply with local laws
- Health records, protected by the Health Insurance Portability and Accountability Act (HIPAA)[1]
- Criminal justice records, protected by Criminal Justice Information Services (CJIS) regulations[2]
- The identity of a witness, informant, investigator, or bystanders
- Investigative methods and tactics
- Sensitive metadata, such as GPS locations, personal identifiers, or serial numbers

Decisions about what information is to be redacted should be made prior to submitting the material to the practitioner. These decisions are best articulated in a detailed edit list using audible/visual descriptors, timecode and transcript references. Consideration should be given to

[1] See *HHS Summary of the HIPAA Security Rule* for further information. https://www.hhs.gov/hipaa/for-professionals/security/laws-regulations/index.html

[2] See *FBI Criminal Justice Information Services (CJIS) Security Policy* for more information. https://www.fbi.gov/file-repository/cjis-security-policy-v5_5_20160601-2-1.pdf/view

the fact that the requestor might not have the training, tools, or experience to observe the recording in sufficient detail, thus missing areas that need redaction.

Note: Redactions should be made in consultation with personnel trained on the release of records, including a thorough understanding of organizational procedures, state laws, and federal regulations. The method of redaction should ensure that information that is exempt by statute or otherwise non-disclosable is redacted without concealing or otherwise blocking relevant information.

6. Overview of Software

Software is required to redact information from recordings. Software allows for the recording to be imported, reviewed, redacted, and exported. It is important to choose software with adequate features to conduct redactions within the scope of organizational procedures and the capabilities of the practitioner. At a minimum, the software should be capable of decoding various types of video and audio codecs, allow for the trimming of recordings, and provide options for video and audio filters (e.g., blur, solid shape, tone). Additionally, it is recommended that the software be capable of automatic tracking of objects for shape, size, and location adjustments. Emphasis should be placed on testing and evaluating software prior to use to ensure the effects are irreversible once rendered.

6.1 Professional Software

Professional software is built for video production and has advanced tool sets, features, and filters. Typically, video production software includes non-linear editors that allow multiple audio or video channels to be combined into a single finished product. They also facilitate controls for either audio or video corrections, clarifications, as well as redaction. They may require experience or training. Production software offers significant control for redacting video and audio; however, it requires manual frame-by-frame analysis and review of content.

6.2 Purpose-built software

Purpose-built software is designed to perform a singular task. The software may be easier to use and typically require less training than professional software but may also lack the full control available in other professional video software options. Purpose-built software may be created to only allow the redaction of specific video or audio formats. They can be useful if the sole purpose is to redact specific types of video (e.g., body worn video, in-car video) or the purpose-built software is a turnkey solution integrated into a digital evidence management system. However, it may not be useful for clarification or combining clips.

6.3 Simplified Video Editors

Simplified video editors are cost-effective digital video editors developed with the average consumer in mind. While these editors are often easier to navigate than those used for commercial production, they typically include fewer advanced features. They are generally adequate for performing basic redaction. For example, a basic redaction may require one filter be added to remove license plate information from a video signal. Whereas an advanced redaction

may require the facial identity of several individuals as well as personal identifiers recorded in the audio channel.

6.4 Open-source software

Open-source software provides a low barrier of entry into selective redactions and is most applicable to the global redaction method. These types of software or utilities are often made to perform a variety of tasks, but the tasks are generally developed by a community of users or developers to solve a wide-range of issues. They may have limitations to the amount of redaction available within the software. The installation and use of open-source software may require advanced computer skills and online research efforts to operate (e.g., knowledge of Windows command-line or Mac OS Terminal, third-party plug-in filter install, use of community forum).

In addition, there may not be formal training available for these types of software; however, they may have active user groups to assist. They may be able to perform basic redaction functions but may fall short at the more refined tasks other software options provide.

7. Forms of Redaction

When deciding upon the most appropriate form of redaction, careful consideration must be given to the desired outcome, based upon the type of information received (if applicable) and any existing legal or organizational requirements. Two forms of redaction are described below:

7.1 Global

For video redactions, one or more filters (e.g., blur, solid shape, mosaic) are applied to an entire segment of the recording. This form of redaction can be accomplished with open source software and scripted to perform bulk redaction but offers the least amount of control over the edits applied. Global redaction may not be appropriate for compliance with some requests for information, as all content will be equally obscured; however, it is likely suitable for preparation of a recording that is being voluntarily released to the press or public.

7.2 Selective

For video redactions only, this requires the user to review specific content and track object(s) through sequential frames to apply filter(s) selectively. This form of redaction can best be performed with professional, purpose-built, or simplified video editing software.

8. Video Redaction Filters

There are several filters available for the redaction of video and audio segments. The video recording, circumstances of the video, reason for redaction, and organizational procedures will ultimately determine the form, effect, and the intensity of the filter applied to the recording. Regardless of the software filter chosen, any redaction performed must remain within the scope of the request while adhering to all applicable mandates for the protection and release of information.

Examples of common filters used in video redaction include mosaic (pixelation), blur, and solid shape (e.g., square, oval or circle filled with an opaque color). In redactions where the subject is the only information that can be released, these shapes can be inverted, leaving the subject clear and the background details redacted. It is strongly recommended to select a filter that once rendered and exported from the software is irreversible. The intensity of the filter should be adjusted throughout the redacted video segments to ensure the protected information is properly obscured and within the scope of the request. It is possible to reveal the identity of a person or disclose protected information if careful consideration is not taken into adjusting the intensity and accuracy of the filter throughout the video.

Practitioners should be cognizant of the forms of redaction and filters used to redact information. It is important to understand the advantages and disadvantages of the approaches. Research has shown that a mosaic filter when set to an extreme pixelation will create a visual effect that prevents humans and machine learning/facial recognition technology from revealing the identity of redacted information. A heavy gaussian blur will make the image unrecognizable by humans; however, research has shown that a machine learning approach may be able to identify the object or subject from the remaining image boundary information.

Filters can be applied to a mask and keyframes can be used to track a moving subject or object over time. This process requires frame by frame analysis and can be time intensive to perform. Some professional and purpose-built software solutions allow for the use of automated object tracking of video. Software testing and evaluation is strongly recommended prior to conducting automated tracking and redactions. In both manual and automated video redactions, the completed effect should be reviewed by the practitioner and requestor for quality assurance and accuracy prior to release.

Software tools may have the ability to perform automated redaction of recordings based on artificial intelligence (AI) and machine learning technology (ML). For more information about AI and ML trends relating to video recordings, refer to *SWGDE Overview Artificial Intelligence Trends in Video Analysis*.

8.1 Solid Shape

This filter can be represented by any shape and color; however, the opacity of the shape must not allow the redacted content to remain visible (Figure 1).

Figure 1

8.2 Blur

Blurring seeks to reduce image detail by modifying pixel values using a mathematical algorithm. An image without fine detail will appear blurred. This process, when taken to an extreme and applied to selected areas of the video, renders the redacted area difficult to see. Considerations should be given when utilizing this filter that some sensitive content may still be visible; therefore, the degree of blurring should be sufficient to conceal all redacted content (Figure 2).

Figure 2

8.3 Mosaic (Pixelation)

This filter distorts the selected area by copying pixels into adjacent pixels both horizontally and vertically. When using the mosaic filter, ensure the cell size or pixel matrix size renders all redacted content unidentifiable (Figure 3).

Figure 3

8.4 Multiple Filters

Combinations of multiple filters can also be used to ensure complete redaction of identifiable content.

9. Audio Redaction

Audio redaction should be based upon a transcript, whenever possible, provided by the requestor and marked to clearly indicate which content is to be redacted. Additionally, the request may include specific phrases or subject content that needs to be redacted. After redaction is complete, the results should be reviewed by the practitioner and requestor for quality assurance and accuracy prior to release.

Redacted audio should be replaced with a controlled signal that is consistent and distinct, but not distracting from the surrounding audio. The consistency of the signal clearly indicates to the listener that a redaction has taken place. It is not recommended to use audio filters to change or distort the pitch of sound for redaction purposes as they may be reversible.

A lengthy redacted segment (greater than two to three seconds) will subject listeners to prolonged exposure to the redaction signal. Variations of the redaction signal may be used to reduce listener fatigue. For example, distinct signals could be used to indicate the start and end of a redacted segment, while a quieter, less fatiguing signal is used for the remainder.

If audio from a video recording must be redacted, care must be taken that the audio and video streams remain synchronous.

9.1 Tone

The recommended audio redaction signal is a single tone or set of tones. The tones should be distinctive but not distracting from other content. Once established, this signal should be used for all redaction activities to create a consistent expectation for the listener.

9.2 Silence

Silence is generally not a recommended method of redaction, as a redacted segment can be confused with original content that contains silence. Silence should only be used when multiple simultaneous audio channels require independent redaction and an inserted tone risks masking content on another channel.

10. Metadata

Digital audio and video file formats support embedding a variety of descriptive and technical information that can be edited without affecting the playback of the file, such as GPS location information, camera serial numbers, names of creators, dates of creation, or software/device information. This information can be decoded and displayed by a variety of software tools, including proprietary player applications, some audio and video editors, and metadata parsers .

This information is also variable depending upon the file format. MP4 supports a few metadata schemas internally (e.g., udta, uuid.), which are different from those supported by others. Not all software that reads metadata within audio and video files can comprehensively report on all data present within a file. The process of determining exactly which metadata is present in a file will require a format specific approach and should include the use of more than one piece of software to read and report on the embedded information.

When metadata is identified for redaction, some software products can be used to remove this data from within the file, so that it cannot be read by future users. It should be verified prior to release of the redacted file that all non-disclosable information has successfully been removed.

Note: Because certain metadata within audio and video formats can be proprietary or stored in user-defined structures within the file, not all software treats it the same. Rewrapping from one

multimedia container to another may cause a loss of embedded metadata, even if not intended by the user.

11. Documentation

All steps in the redaction process should be appropriately documented in accordance with organization policies and procedures. Consider using a redaction worksheet to ensure accuracy.

Prior to releasing redacted visual and audio files, consult with the appropriate parties to ensure that all redaction requirements are met.

Details of all redactions with justification(s) for non-disclosure should be properly documented. This is intended to ensure transparency, inform the requester of information received, and ensure reproducibility, should future requests for the same recording be received. Below is an example of the redaction detail for a video recording with a brief justification description.

Date	Original Filename	Timecode In hh;mm;ss;ff	Timecode Out hh;mm;ss;ff	Redaction Form	Filter Applied	Exempt Information	Redacted Video Filename
06/30/23	filename.mp4	00;01;22;14	00;02;52;24	Selective	Black Circle	Face of Victim	filename_redacted.mp4

Figure 4. Example of redaction worksheet.[3]

12. Redaction Workflow

Redaction requests should be submitted in writing and include the information needed to complete the redaction (e.g., date, time, area[s]/content of interest, audio to be exempted). All steps in redaction should be appropriately documented in accordance with organization policies and procedures.

12.1 Video Redaction

- Receive and review the information request.
- Acquire the source recording. Considerations should be made as to hash verification and documentation of the source media in accordance with organization policies and procedures.
- Create a working copy of the source recording. Considerations should be made as to hash verification and documentation of the working copy in accordance with organization policies and procedures.
- Interrogate and analyze the recording to determine:
    - Display resolution, pixel aspect ratio, frame rate and codec and audio sampling rate;
    - Any additional metadata that would assist in determining the software project or sequence settings.

  - ***Note:*** When redacting a file, some metadata will be lost from the source file, as the editing software will create a new file. If the multimedia container includes separate files for metadata, it may be possible to preserve this data.
- Open or import the working copy of the recording into redaction software. Create a project that mirrors the specifications of the original recording (e.g., 1920 x 1080, 16:9, 29.97 fps, 44.1 kHz). Some software automates this process; however, it is important to verify these technical properties for proper software playback and review. If needed, change the multimedia container to one that is compatible with the video editor. Transcoding the file may be necessary to allow a recording to be redacted. For more information, an explanation of video containers and the potential issues that can arise from transcoding can be found within *SWGDE Technical Overview of Digital Video Files* [3].
- Review the recording to determine the area(s) to be redacted.
  - Identify the beginning and end points for each segment of video and audio.
  - Identify any embedded timestamps in the recording; however, these may not be as useful a reference as file runtime.
  - The use of readily available media players (e.g., VLC, QuickTime, Windows Media Player) or embedded timestamps is recommended to communicate recording runtimes and for playback for all parties involved.
  - A brief content description (e.g., social security number, juvenile in blue sweater) will increase accuracy and efficiency regarding content references.
- Determine the form of redaction to be applied.
- Choose the redaction filter to be applied.
  - ***Note:*** The closer the subject or object is to the recording device may require an increase to the intensity of the redaction filter to obscure the subject or object.
- Draw a filter mask around the area of interest to obscure the identity of the subject or object.
- For selective redaction, track the subject or object through the video by adjusting position, scale, and intensity of the mask.
- Document a brief description of the content and redaction filter applied.
  - ***Note:*** Some organizations may require titling sequences within the derivative video to communicate the documented content for the viewer.
- Review the content to ensure the visual redaction was properly applied. Make continual adjustments to position, scale, and intensity of the mask if the subject or object to be redacted becomes visible.

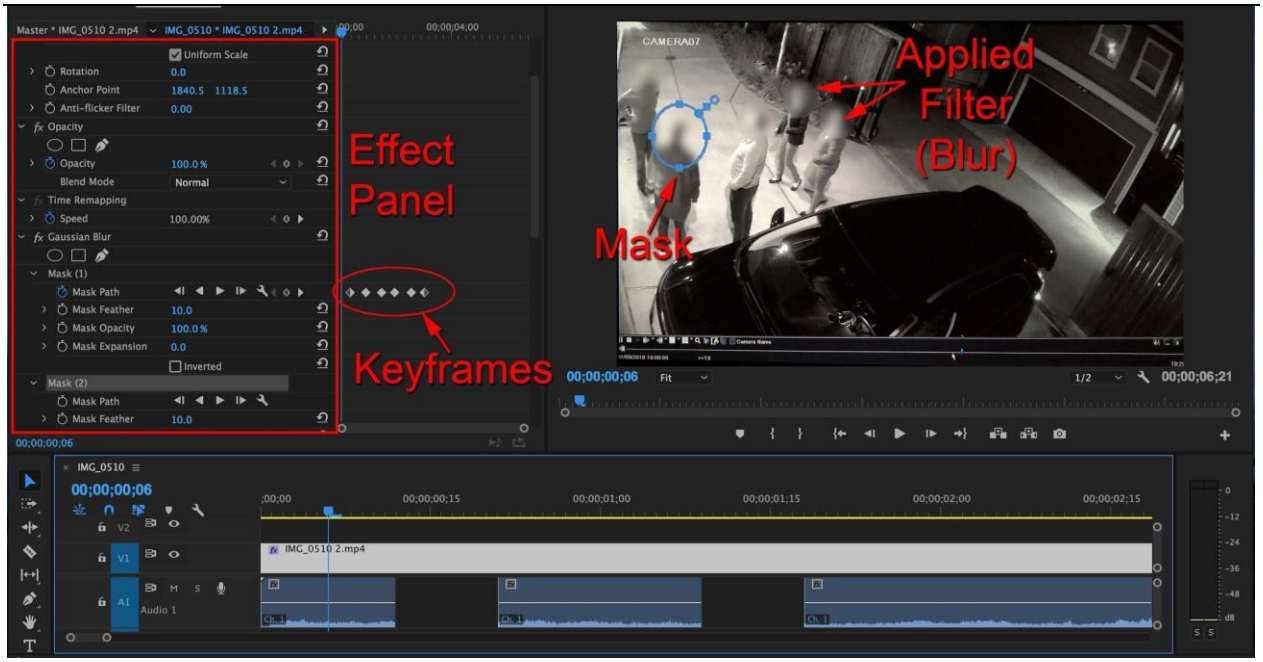

Figure 5. Example of video redaction

12.2 Audio Redaction:

- Use a software tool to select the segment to be redacted.
- Replace that segment with the redaction signal.
- Document the starting and ending timecode of the redacted segments.
- Review the redaction for accuracy.
- Once all non-disclosable material has been redacted, export the video and/or audio recording with the original source properties (e.g., the display resolution and frame rate should match the original source properties). *Open file formats should be utilized; however, considerations may be made to conform to any applicable organization policies or procedures.
- The exported file name should clearly indicate that the content has been redacted (e.g., filename_redacted.mp4).
- Review the exported video and/or audio file(s) to ensure proper playback.
- When returning the results to the requestor, any copies of the redacted video and / or audio file(s) should be accompanied with the original media.
- The software project files and source media should be retained in accordance with the organization policy and procedures.
- Considerations should be made as to hash verification and documentation of the results media in accordance with organization policies and procedures.

- Any distributed redacted copies should be written to write-once optical media or shared through cloud technology with audit trails. Other media may be utilized as approved by the practitioners organization in accordance with the organization policy and procedures.

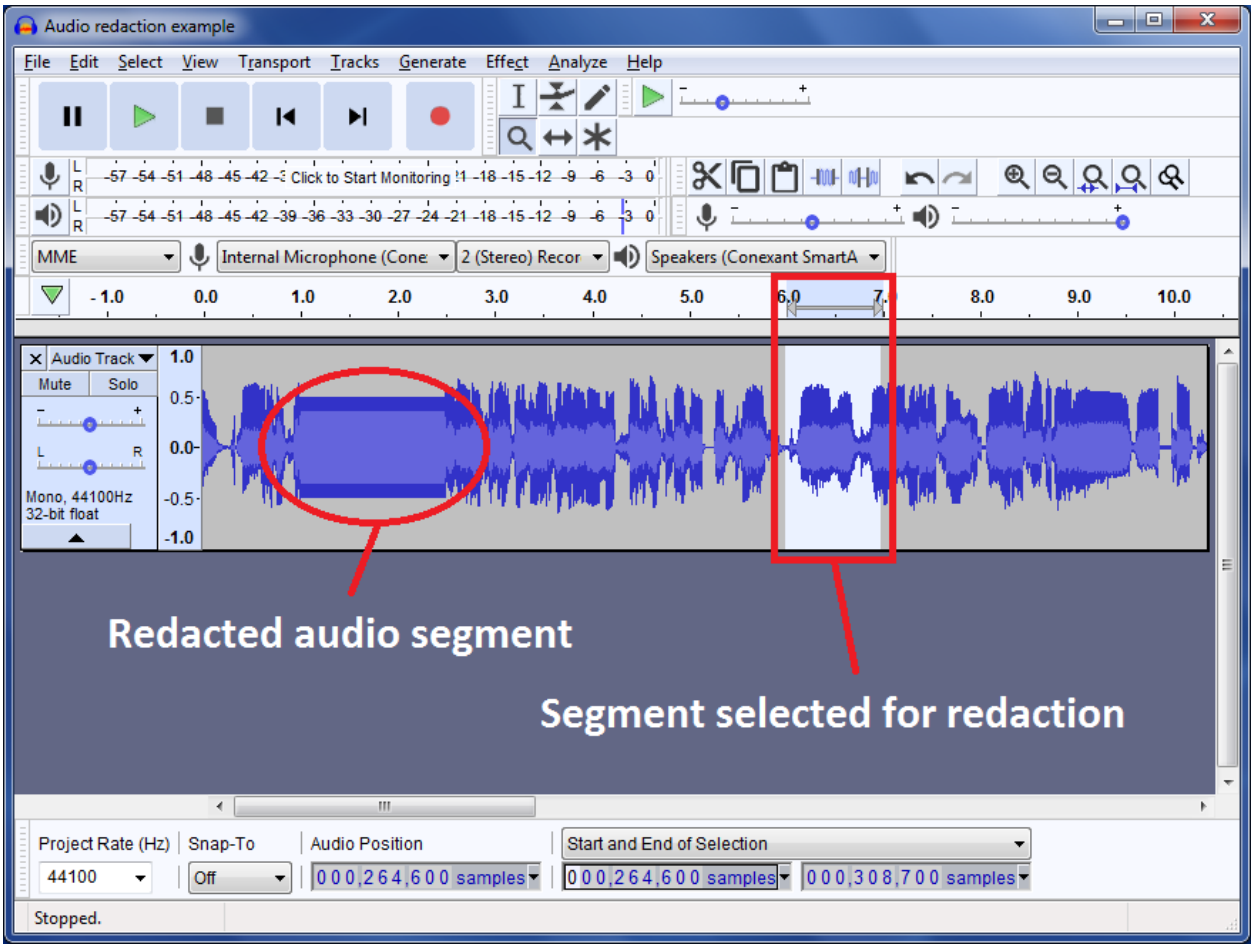

Figure 6. Example of an audio waveform showing a redacted audio segment and a segment selected for redaction.

13. References and Publications

The resources listed below are referenced in this document and/or provide information that may prove helpful to the examiner:

[1] CJIS Information Security Officer, "Criminal Justice Information Systems Security Policy," U.S. Department of Justice, Federal Bureau of Investigation, CJISD-ITS-DOC-08140-5.5, June 1, 2016. [Online]. https://www.fbi.gov/file-repository/cjis-security-policy-v5_5_20160601-2-1.pdf/view

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[12] Scientific Working Group on Digital Evidence, "SWGDE Best Practices for Forensic Audio". [Online]. https://www.swgde.org/documents

S*WGDE Best Practices for Digital Forensic Video Analysis* and *SWGDE Best Practices for Forensic Audio*

14. History

Revision	Issue Date	History
1.0 DRAFT	6/14/2018	Initial draft created and voted by SWGDE for release as a Draft for Public Comment.
1.0 DRAFT	7/9/2018	Formatting and technical edit performed for release as a Draft for Public Comment.
1.0	9/20/2018	No changes were made following the Public Comment period. SWGDE voted to publish as an approved document.
1.0	11/20/2018	Formatted and published as Approved version 1.0.
2.0 DRAFT	9/19/2019	Technical edits to remove vendors and address emerging research on gaussian blur. SWGDE voted to release as a Draft for Public Comment.
2.0	9/29/2019	Formatted and published as version 2.0.
2.1 DRAFT	9/20/2023	Added additional clarification to timecode identifications by the requestor, added reference to AI document and demonstrative titling for derivative exhibits. Various layout and grammatical errors addressed and corrected. Put forward for SWGDE membership vote to release as a Draft for Public Comment.
2.2 DRAFT	2/29/2024	SWGDE voted to release as a Draft for Public Comment; formatted for release for public comment.
2.2	5/16/2024	No public comments received. Moved forward for SWGDE membership vote to release as a Final Approved Document.
2.2	7/29/2024	SWGDE voted to approve as a Final Approved Document. Formatted for release as a Final Approved Document.