A. Purpose:

To set guidelines and procedures for Digital Image Management

B. Responsibility:

Latent Print Examiners

C. Procedure:

1. General Evidence Procedure for Submitted Digital Media

1.1 All submitted digital images will be scanned for viruses in a laboratory workstation containing up-to-date antivirus software regardless of whether or not enhancements will be performed. This step is necessary to protect against computer viruses and potential corruption of the AFIS database.

1.2 Upon receiving media containing digital images of latent print evidence, the assigned examiner will inspect the physical media for any visible or obvious signs of damage. Any damage will be noted on an appropriate worksheet. If necessary, the submitting agency will be contacted prior to attempting any recovery or repair of the submitted digital media found to be damaged.

1.3 Once the inspection of the submitted media has been performed, the digital images will be copied to an appropriate "read only" storage device such as CD-R or DVD-R media or transferred as "read only" image files into a virtual case folder. These digital images that have been transferred to virtual case folders are considered working copies and not considered evidence. These images may now be enhanced utilizing approved software (see Appendix 2). The enhancement process will be documented either through metadata, history files or notes. Image files that have been enhanced or modified in any other fashion will be renamed and saved in a virtual case folder.

1.4 A virtual case folder will be created for storage of computer files created by the latent print examiner or submitted to the laboratory for analysis. The virtual case folder shall incorporate the laboratory case number. Upon completion of the case being examined, the virtual case folder shall be transferred to a secure server and also written to write once only media which will be filed in the latent print file storage area until such time that they are transferred to the laboratory's archive file storage area.

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1.5 Please refer to LP SOP-26 for electronically submitted latent prints.

2. General Evidence Procedure for Submitted Lifts

2.1 Upon receiving latent transfer lift(s) for analysis or comparison, the examiner shall determine if the lift(s) will be digitized and entered into a virtual case folder on the computer being utilized (the main or parent folder shall contain the laboratory case number). Lifts containing friction ridge impressions of value will be imaged using a flatbed scanner or digital camera. The examiner shall determine the appropriate digital imaging capture method. The following are recommended scanner & camera settings:

Scanner Reflected Images
1000 ppi or the minimum acceptable AFIS input (whichever is greater)

Scanner Transparent Images
1000 ppi or the minimum acceptable AFIS input (whichever is greater)

Digital Camera & Scanner Settings (file type utilized is at the option of the examiner)

Image/Capture size set to:	Largest size possible
JPG File Type:	(set to highest quality setting available)
Tiff File Type:	(set to highest quality setting available)
RAW File Type:	(set to highest quality setting available)
JPG+RAW Combination:	(highest quality setting available)

2.2 Upon completion of the documentation process, all digital images shall be made part of the case file. Digital images shall be managed as specified in sections 1.3 and 1.4 above.

2.3 Photocopying or digital imaging can be utilized for the initial documentation of latent transfer lifts. The method of choice is at the option of the examiner.

3. General Evidence Procedure For Submitted Film Negatives

3.1 Film negatives may be digitized by using a latent print unit flatbed scanner. The examiner shall determine the appropriate scanning method. The following recommended scanner settings are:

Scanning Film Negatives
1000 ppi or the minimum acceptable AFIS input (whichever is greater)

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Capture File Types (type utilized is at the option of the examiner)	
JPG File Type	(set to highest quality setting available)
Tiff File Type	(set to highest quality setting available)
RAW File Type	(set to highest quality setting available)

3.2 Scanned images may be saved as a TIFF, high quality JPG or any other format providing equal or better quality than a JPG image.

3.3 Upon case completion, scanned images of value will be managed as specified in sections 1.3 and 1.4 above.

4. General Evidence Procedure For Submitted Physical Evidence For Processing

4.1 Visible or developed friction ridge impressions determined to be of value will be documented utilizing digital imaging.

4.2 Upon completion of the documentation process all photographs and digital images shall be made part of the case file.

4.3 Latent print examiners wishing to document evidence during the examination process will use a laboratory issued digital camera or flatbed scanner. Once digital images have been captured, images on the captured card will be transferred as into a virtual folder. When the transfer is complete the images should be marked as read only. Upon completion of the case being examined, the virtual case folder shall be managed as specified in section 1.4 above.

4.4 Media cards may be reformatted after digital images contained therein have been transferred into a virtual folder.

5. Case File Documentation

5.1 Either history logs, notes or metadata will be use to record changes made to digital images for enhancement purposes. This will be the responsibility of the examiner performing such enhancements.

6. File Integrity And Retention

6.1 Upon case completion digital case files will be stored on a secure laboratory server in addition to the creation of a write once only archive disc.

6.2 Archive disks and/or packaging will contain at minimum the following information:

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a. Division of Scientific Services Lab ID Number
b. Creators Initials
c. Other descriptive information as determined by the examiner.

7. Flatbed Scanner Function Test

7.1 An optical target containing known measurements will be used on a bi-annual basis to test and assure flatbed scanner accuracy. An offset of more than 1mm in one square inch shall be unacceptable.

7.2 A log book containing the results of such test and the optical target shall be kept in the latent print section.

7.3 Any equipment found not to perform correctly either through external testing or system diagnostics shall be immediately removed from service until repaired or replaced.

8. Best Practices for the Digital Processing and Enhancement of Latent Print Evidence

8.1 The latent print examiner will determine if image enhancement of latent print evidence is required. Enhancements shall be performed on "read only" or "duplicate" images unless the enhancement software (such as CSIpix) automatically renames the file on a save command. Duplicate copies of original images shall be known as "working copies" or "working images". Original source images shall not be altered.

8.2 Only approved software shall be utilized for enhancing digital images (see Appendix 2). Tools that are part of the State of Connecticut AFIS or Federal NGI ULW are also authorized for use.

8.3 When performing image enhancements the examiner will refer to the Image Processing Guidelines when applicable (see Appendix 1)

9. AFIS Digital Image Entry

9.1 When needed only laboratory provided thumb drives will be utilized when transferring digital images into the DESPP CT-AFIS/NGI database.

9.2 Such thumb drives shall be dedicated to laboratory use only.

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9.3 Digital images imported into the CT-AFIS/NGI database will be appropriately calibrated as required by the system software. This is to ensure that accurate searches are conducted.

10. Function Testing of New Enhancement Software

All new latent print unit software utilized for enhancing images will be performance checked for consistency and repeatability of results. Proprietary AFIS systems not under the control of DSS shall not apply to this section.

a. Samples images will be imported into the software.

b. Filters utilized for enhancement will be applied to the images and the settings will be recorded.

c. The enhanced images from the series of testing will be saved.

d. This above process will be repeated for each filter utilizing the same settings two additional times for a total of three images. The computer being utilized for the testing will be restarted prior to each of the two additional test cycles.

e. The processed images will be analyzed to determine any unacceptable differences. A digital imaging difference filter or its equivalent or a hashing program may be utilized to make this determination.

f. Tested software and filters which produce unacceptable results will not be used for case work.

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APPENDIX 1

Image Processing Guidelines

The following is a guideline of filters and tools (or their equivalents) which can be used to enhance an image. As such it is ultimately up to the examiner to determine which types of tools and filters are to be utilized for a particular enhancement based on his/her experience.

1. Do not do anything that can change an original image (the original image should be write protected or duplicated).

2. Consider using the a color mode to remove one color value:
   a. RGB
   b. Chromatic FFT
   c. CMYK
   d. Lab Color (Lightness channel, Channel a (green + red) or Channel b (green + blue) when using LAB mode it is necessary to adjust the levels in Channel A and Channel B to properly evaluate the information contained within those two channels.

3. The following tools or their equivalent can be used to remove two or more color values as well as adjust the color values so that a color channel may be used to eliminate the background.
   a. Hue & Saturation (eliminates two or more color values: used in conjunction with Calculations to eliminate background noise)
   b. Color Balance
   c. Black & White
   d. Variations

e. Photo Filter

4. The following tools can be used to adjust tonal range and contrast:
    a. Levels
    b. Curves
    c. Layer and Object Filters
    d. Shadow/Highlight (balance tonal range and contrast)
    e. Exposure (balance tonal range)
    f. Burn and Dodge (see Guidelines for Brush Tools below)
    g. Brightness/Contrast

5. The following filters can be used to sharpen an image:
    a. Unsharp Mask
    b. Smart Sharpen
    c. Sharpen Edges

6. Guidelines for Brush Tools (Burn and Dodge)
    a. Always choose a soft (feathered) round brush.
    b. Always choose a brush size that is at least four to five ridges in diameter.
    c. Always apply the brush at a right angle to the ridges. Do not follow ridge flow.

7. Feathering Guidelines for Area of Interest Tools (Marquee and Lasso Tools)
    a. Determine image resolution
    b. From the tool bar choose the appropriate area of interest tool.
    c. Use the mouse to select the area of interest to be processed.
    d. Go to Modify > Feather

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i. If resolution is less than 1500ppi, multiply the number of hundreds by 3. The sum is the "Feather Radius" value you must use (i.e. 1000ppi = 3000).

ii. If resolution is more than 1500ppi, multiply the number of hundreds by 4. The sum is the "Feather Radius" value you must use (i.e. 2400ppi = 9600).

Note: If you select the area first then try to enter the feather radius in the Feather field on the tool options bar, it will have no effect on the current selection; it will only effect future selections.

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APPENDIX 2

Approved Software

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AccessData FTK Imager
For the forensic imaging of digitally captured latent impressions determined to be evidence.

Adobe Photoshop
For viewing, analyzing and enhancing digital images and preparing exhibits.

CorelDraw Graphics Suite
For viewing, analyzing and enhancing digital images and preparing exhibits.

CSIpix
For viewing, analyzing and enhancing digital images and preparing exhibits.

Epson Scan Software
For digitizing reflective and transparent materials including film negatives.

Jdirprinter
For printing a list of files contained within a directory and/or subdirectory.

PieStudio
For extracting & write protecting digital images from storage media and also used for preparing and printing proof sheets.