Purpose: To enhance digital images for comparison purposes.

Responsibility: Forensic Science Examiners assigned to the Imprint Unit are responsible to follow the guidance of this procedure.

Safety: All proper personal protection equipment will be used as appropriate.

Procedure:

A. Enhancement of Images

1. All images received by the Imprints Unit as evidence will be copied onto the hard drive of the examiner's computer. All CD's, DVD's and other media submitted to the laboratory will be scanned for viruses using proper security software before files are downloaded to the examiner's computer.

2. Image enhancement will only be performed on a copy file, which has been made from the original file. The original image is never touched.

3. The history of any enhancement is maintained for each image that is enhanced, either within the software program used, the case notes, or other appropriate documentation. Available software programs include Adobe Photoshop.

4. Adjustments and enhancements using the following filters/applications may be applied: levels, curves, deinterlace, channel mixer, reduce noise, sharpen/unsharpen, sharpen more and invert, desaturate, remove moiré, crop/stitch and resampling, difference/averaging filters.

   The following descriptions are filters and other applications that may be used in the examination and enhancement of digital image files. However, this is not an all-inclusive list of tools that may be used.

   Blur: This effect softens the edges or reduces detail in an image.
   Brightness & Contrast: This effect adjusts the brightness and contrast of the color tones located in the image.
   Channel Mixer: Adjustment of color in an image by choosing a RGB (red, green, blue) channel to adjust the intensity and saturation of that hue in an image.
   Deblur (lens and motion): This filter attempts to correct the pixel alignment to adjust a blurred image due to the lens focus being incorrect or the motion of an object in the image.
   Desaturate: Desaturation is the adjustment of the red, green and blue channels towards the gray spectrum. Creates a black and white in the RGB mode.
   Difference/Averaging Filter: Traditional photographic technique used to enhance the detail of an image by reducing the amount of noise or static. Combines two or more exposures of the same

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scene to bring out detail and obtain a richer and more vivid photograph.
Dodge/Burn: Traditional photographic technique to light or darken specific areas of a print by regulating the exposure.
Invert: This effect inverts the color information of an image. This technique may be used to bring out patterns or details from an image.
Levels/Curves: The levels effect adjusts the brightness/contrast of a clip. It combines the functions of the color balance, gamma correction, brightness, contrast and invert effects.
Lucis Pro®: Photographic filter that enhances images by adjusting high, medium and low contrast
areas and corrects exposure levels.
Resampling: the addition or removal of pixels to prevent the loss of image details during the enlargement of an image.
Reduce Noise: Image noise appears as random extraneous pixels that are not part of the image detail. Image noise can appear in two forms: luminance (grayscale) noise that makes an image appear grainy and color noise that appears as colored artifacts. The filter reduces luminance noise
through adjustment of the blue channel. Color noise is reduced by the filter by adjusting the color channels.
Reduce Moiré: Moiré is patterns caused by interference between two sets of grids. These are commonly encountered in scanned images and in images with fine linear patterns. The filter adjusts the horizontal and vertical lineup of the pixels and softens the edges of the pixels.
Scale or Magnify: The ability to zoom in or zoom out of an image.
Sharpen/Sharpen more filters: Improves image clarity and emphasizes small details and sharp contrasts.
Shadow/Highlight: Photographic technique that adjust the exposure levels in highlighted or shadowed area of an image.
Stitching: Allows the creation of photos with higher resolution or wider view. This stitching provided a seamless joining of multiple digital images.
Unsharpen: Filter applied to soften the pixel edges.

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5. The examiner will never use tools that can clone, copy or add pixels to the same image.

B. Changing Photos to Natural Size using Photoshop

1. Rotate the image so that the scale (longest edge) is parallel with either the bottom or side of the photograph.
   a. Select the following in photoshop: “image” → “image rotation” → “arbitrary”.
   b. Zoom into the scale and check that it is parallel using the rectangular tool, rectangular marquee tool, or another tool as appropriate.
   c. While remaining zoomed into the image, use the crop tool to crop out a section of the scale in multiples of 1 inch or 1 centimeter (depending on the measurements present on the scale). This may be done using 1 inch or 1 centimeter if necessary; but the longer the area used, the more accurate the measurements can be made.

d. Go to "Image"→ "Image Size". Look at the number of pixels in the width or height (depending on which direction the scale that you used is located in the image). Divide that number by the number of inches or cm to determine the pixel/inch or pixels/cm. Undo the crop using Ctrl+Z or the menu "Edit → "Undo crop".

e. Go to "Image" → "Image Size". Making sure that the "Resample Image" box is unchecked, change the pixels/inch or pixels/cm to the number obtained in step 3.

f. Right click on the rulers to make sure that they are in the correct unit (inches or cm). Using the "Move Tool" drag a line from the ruler to one end of the scale and second line to the other end of the scale. Using the ruler confirm that the measurements are correct.

g. All steps of the digital processing/enhancement will be recorded in the case file.

Sources of Error: N/A
Quality Assurance: N/A

References: See bibliography.

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