

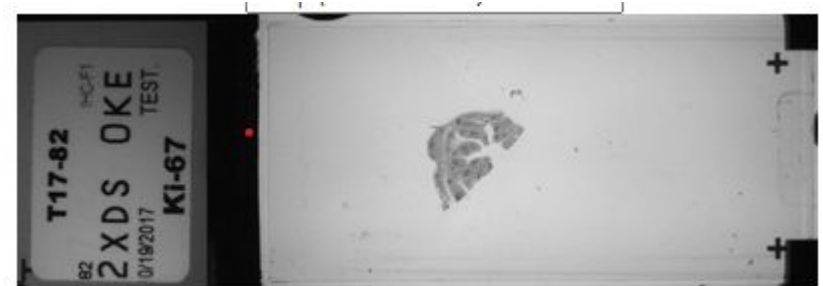
Whole Slide Imaging (WSI) Deidentification Workflow

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Protected Health Information in WSI

- WSI can leak in different places due to variety of scanner types.
- Nearly all IRB's require PHI to be removed from images prior to upload
- For WSI images, if present, there are three places PHI are likely to reside
 - Filename
 - Embedded Image Metadata
 - Embedded Label Image

Property	Value
aperio.AppMag	20 REDACT <input type="text" value="Keep (do not redact)"/>
aperio.Date	12/14/18 01/01/18
aperio.DisplayColor	0 REDACT <input type="text" value="Keep (do not redact)"/>
aperio.Exposure Scale	0.000001 REDACT <input type="text" value="Keep (do not redact)"/>
aperio.Exposure Time	109 REDACT <input type="text" value="Keep (do not redact)"/>
aperio.Filename	28-A 0579XY112001_03_10
aperio.Focus Offset	-0.000500 REDACT <input type="text" value="Keep (do not redact)"/>



Embedded Image Metadata

```
TIFF Directory at offset 0xbbc777fe (3150411774)
Subfile Type: (0 = 0x0)
Image Width: 109559 Image Length: 84381 Image Depth: 1
Tile Width: 240 Tile Length: 240
Bits/Sample: 8
Compression Scheme: JPEG
Photometric Interpretation: RGB color
YCbCr Subsampling: 2, 2
Samples/Pixel: 3
Planar Configuration: single image plane
ImageDescription: Aperio Image Library v12.0.15
111760x84481 [0,100 109559x84381] (240x240) JPEG/RGB Q=70|AppMag = 40|StripeWidth = 2032|ScanScope ID = APERIONP|Filename = E20-72_8 TAU|Date = 08/24/20|Time = 22:27:25|Time Zone = GMT-04:00|User = 81e564c9-09ad-4e80-95ce-ec8daa7330cd|MPP = 0.2519|Left = 17.393621|Top = 22.502415|LineCameraSkew = 0.000365|LineAreaXOffset = -0.014056|LineAreaYOffset = 0.007910|Focus Offset = 0.000000|ImageID = 1030008|Exposure Time = 45|Exposure Scale = 0.000001|DisplayColor = 0|SessionMode = NR|OriginalWidth = 111760|OriginalHeight = 84481|ICC Profile = AT2
ICC Profile: <present>, 1687824 bytes
JPEG Tables: (574 bytes)
TIFF Directory at offset 0xbbf713d0 (3153531856)
Subfile Type: (0 = 0x0)
Image Width: 997 Image Length: 768 Image Depth: 1
Bits/Sample: 8
Compression Scheme: JPEG
Photometric Interpretation: RGB color
YCbCr Subsampling: 2, 2
Samples/Pixel: 3
Rows/Strip: 16
Planar Configuration: single image plane
ImageDescription: Aperio Image Library v12.0.15
109559x84381 -> 997x768 - |AppMag = 40|StripeWidth = 2032|ScanScope ID = APERIONP|Filename = E20-72_8 TAU|Date = 08/24/20|Time = 22:27:25|Time Zone = GMT-04:00|User = 81e564c9-09ad-4e80-95ce-ec8daa7330cd|MPP = 0.2519|Left = 17.393621|Top = 22.502415|LineCameraSkew = 0.000365|LineAreaXOffset = -0.014056|LineAreaYOffset = 0.007910|Focus Offset = 0.000000|ImageID = 1030008|Exposure Time = 45|Exposure Scale = 0.000001|DisplayColor = 0|SessionMode = NR|OriginalWidth = 111760|OriginalHeight = 84481|ICC Profile = AT2
JPEG Tables: (289 bytes)
```

Results of tiffinfo on an Aperio Image provides access to some of the internal TIFF metadata.

```
ImageDescription: Aperio Image Library v12.0.15
109559x84381 -> 997x768 - |AppMag = 40|StripeWidth = 2032|ScanScope ID = APERIONP|Filename = E20-72_8 TAU|Date = 08/24/20
0.2519|Left = 17.393621|Top = 22.502415|LineCameraSkew = 0.000365|LineAreaXOffset = -0.014056|LineAreaYOffset = 0.007910|
DisplayColor = 0|SessionMode = NR|OriginalWidth = 111760|OriginalHeight = 84481|ICC Profile = AT2
```

As an example, the ImageDescription tag may contain the original filename, it may contain specific dates or other PHI.

Embedded Images

- Primary image is unlikely to contain PHI
- Many vendors include a low-resolution “macro” image and/ or “label” image

Label



Macro

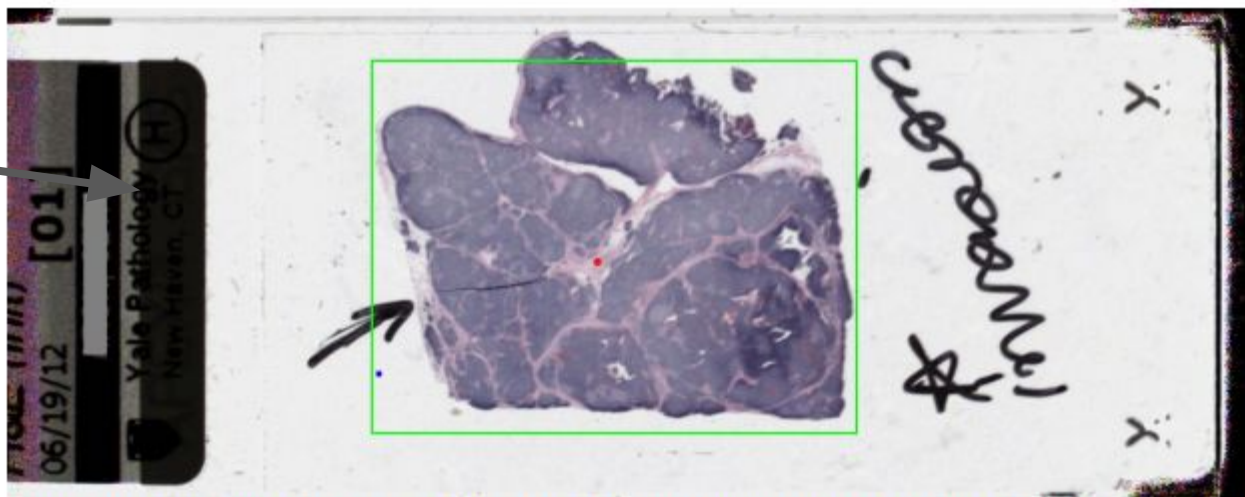


Example Label and Macro WSI Image

Removing PHI from Slides

Easiest solution is to rescan slide with a new label... but..

making it easier to find and mark them for reprocessing.



I've
seen
names
here too!

Figure 4: The macro image from TCGA file TCGA-4X-A9FB-01Z-00-DX1.211CC9AA-F721-4D16-8663-68A393223F80.svs. The left side shows part of the label which included the patient name.

This has been manually redacted with a grey bar in this figure. This file was released to the public in 2016.