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FORENSIC TESTING PROGRAM

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Forensic Video Analysis
Test No. 23-5581 Summary Report

Participants were provided with evidence data acquired from a video surveillance system. They were asked to examine the evidence utilizing their own tools and methods. Results were returned from 54 participants and are compiled in the following tables:

This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

Manufacturer's Information

The Forensic Video Analysis test consisted of evidence data acquired from a video surveillance system. Participants were asked to enhance and clarify the video and produce a derivative that makes it easier to see and understand the incident.

SAMPLE PREPARATION:
A predetermined staged event involving a vehicle of interest meeting numerous other vehicles and an object being passed between two individuals six times was executed and video recorded. A single camera view from a DVR captured this event.

The .MKV file was zipped and uploaded to the CTS Portal for participants to download. A MD5 and SHA1 hash value was calculated and provided for the compressed file to allow participants to validate the successful download of the file.

SAMPLE VALIDATION/VERIFICATION: The combination of internal test validation and the responses received from predistribution testing structured the final questions utilized in this test. The following list of tools were utilized in the validation of this test: Amped FIVE, MediaInfo, GOM Player, Starwitness FreezeFrame, Wondershare, Quick Hash. CTS does not endorse any particular tools.

PLEASE NOTE: Information provided in this report is based on the expected responses from the manufacturer. Further information and discussion will be available in the final summary report.

SCENARIO PROVIDED TO PARTICIPANTS

A vehicle of interest has been seen repeatedly meeting with numerous other vehicles at a spot in a residential neighborhood. Digital video was captured by a nearby homeowner's surveillance system. Enhance and clarify the video and produce a derivative that makes it easier to see and understand the incident.

Manufacturer's Information, continued

Question	Manufacturer's Expected Response - Examination Questions

1-1 What is the SHA1 hash value of the video file?

Expected Response:

a2e1961c66bbaec676b28085fdc602cfe577ff6d

1-2 What is the container format?

Expected Response:

Matroska

1-3 What is the reported frame rate of the video file (report as a numeric value in fps)?

Expected Response:

7.5

1-4 Using the on screen timecode display for reference, how many frames are there for each second that passes in the video?

Expected Response:

15, 15+ or 16

1-5 What is the resolution of the video file?

Expected Response:

1920x1080

1-6 Is there an audio track as an element of the video file?

Expected Response:

No

Question	Manufacturer's Expected Response - Enhanced Video Examination

2-1 Note methods or tools used and settings for the video enhancement here.

Expected Response:

This was a free form question on methods and tools used. No manufacturer's response expected.

2-2 How many times do you see something being passed from one person to the other during the interaction?

Expected Response:

6 or 7

Summary Comments

This test was designed to allow participants to assess their proficiency in data verification, media characterization, data analysis and video enhancement using their own tools and methods. The participants were provided with data acquired from a video surveillance system and were asked to answer questions as well as make enhancements to the video. (See Manufacturer's Information for preparation details, test scenario, and test questions)

A total of 54 participants returned results for this test.

A variety of software tools were used by participants during examination with 33 of the 54 participants reporting the tool Amped FIVE.

All questions achieved consensus responses greater than 90%. While Question 1-4, which asked "how many frames are there for each second that passes in the video," achieved consensus it received the most inconsistent responses (5). After review with the expert, the lower consensus value may have been due to how the question was phrased.

CTS recognizes that examiners in different organizations may not perform all the same tasks. In order to allow participants and accrediting bodies to objectively measure enhancement and/or investigative skills, this test may have included questions that are outside the laboratory's normal reporting procedures.

Forensic Video Examination Responses

TABLE 1

Question 1- 1 : Examination Questions

Question 1-1: What is the SHA1 hash value of the video file?

Manufacturer's Expected Response: a2e1961c66bbaec676b28085fdc602cfe577ff6d

WebCode	Response
24XPA3	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
2QBFPJ	a2e1961c66bbaec676b28085fdc602cfe577ff6d
36JKZE	SHA1: A2E1961C66BBAEC676B28085FDC602CFE577FF6D
3BCXA6	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
3D7J7G	a2e1961c66bbaec676b28085fdc602cfe577ff6d
3TUURJ	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
4AXDXY	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
4YG4D2	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
664CE7	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
9373XZ	a2e1961c66bbaec676b28085fdc602cfe577ff6d
9BBACZ	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
9F67Z7	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
A9U3U4	a2e1961c66bbaec676b28085fdc602cfe577ff6d
BD743R	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
D6RY6R	a2e1961c66bbaec676b28085fdc602cfe577ff6d
DMDYHR	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
DRLJ64	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
DZ3VKP	a2e1961c66bbaec676b28085fdc602cfe577ff6d
EMDGYX	a2e1961c66bbaec676b28085fdc602cfe577ff6d
FBV4CQ	a2e1961c66bbaec676b28085fdc602cfe577ff6d
FFZL7N	a2e1961c66bbaec676b28085fdc602cfe577ff6d
FUHC6Q	a2e1961c66bbaec676b28085fdc602cfe577ff6d
GE6VJV	a2e1961c66bbaec676b28085fdc602cfe577ff6d
GELYAG	a2e1961c66bbaec676b28085fdc602cfe577ff6d
HEN2JL	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
HKAUTZ	a2e1961c66bbaec676b28085fdc602cfe577ff6d
JG6L2U	a2e1961c66bbaec676b28085fdc602cfe577ff6d
KWGGWG	a2e1961c66bbaec676b28085fdc602cfe577ff6d
L93DBK	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
L9EK4T	a2e1961c66bbaec676b28085fdc602cfe577ff6d
LWRMTH	A2E1961C66BBAEC676B28085FDC602CFE577FF6D

TABLE 1

Question 1- 1 : Examination Questions	
WebCode	**Response**
MBNJ4F	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
MVXGRH	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
NJRFJG	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
PEG3MP	a2e1961c66bbaec676b28085fdc602cfe577ff6d
PMAWE8	a2e1961c66bbaec676b28085fdc602cfe577ff6d
QJBHTM	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
RCZC4A	a2e1961c66bbaec676b28085fdc602cfe577ff6d
RWTNYC	a2e1961c66bbaec676b28085fdc602cfe577ff6d
T4RKFX	a2e1961c66bbaec676b28085fdc602cfe577ff6d
TAVG4T	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
TV9WF4	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
U7AYH2	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
URNB3M	a2e1961c66bbaec676b28085fdc602cfe577ff6d
V8JJMG	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
VQ83FE	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
VV3UNC	a2e1961c66bbaec676b28085fdc602cfe577ff6d
WCR6BE	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
WFRDFN	Not required in our method. [The hash was confirmed by our IT department, however]
XBQBKX	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
XR36KA	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
XYWBEB	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
Z3BRL7	A2E1961C66BBAEC676B28085FDC602CFE577FF6D
ZQU3LF	A2E1961C66BBAEC676B28085FDC602CFE577FF6D

Question 1-1: What is the SHA1 hash value of the video file?

Consensus Result: a2e1961c66bbaec676b28085fdc602cfe577ff6d

TABLE 1

Question 1- 2 : Examination Questions

Question 1-2: What is the container format?

Manufacturer's Expected Response: Matroska

WebCode	Response
24XPA3	.mkv/Matroska
2QBFPJ	mkv (Matroska)
36JKZE	.mkv
3BCXA6	Matroska (mkv)
3D7J7G	mkv - Matroska
3TUURJ	Matroska (*.mkv)
4AXDXY	.mkv
4YG4D2	MKV
664CE7	MKV (Matroska Video)
9373XZ	Matroska (MKV)
9BBACZ	MKV
9F67Z7	mkv - matroska, webm
A9U3U4	Matroska
BD743R	MKV
D6RY6R	Matroska, webm
DMDYHR	mkv
DRLJ64	mkv (Matroska Video File)
DZ3VKP	MKV
EMDGYX	.mkv
FBV4CQ	.mkv
FFZL7N	Matroska
FUHC6Q	Matroska
GE6VJV	mkv (Matroska)
GELYAG	mkv
HEN2JL	MKV (Matroska Video File)
HKAUTZ	Matroska (MKV)
JG6L2U	mkv
KWGGWG	.mkv
L93DBK	MKV
L9EK4T	Matroska (MKV)
LWRMTH	Matroska (.mkv)
MBNJ4F	File Format MKV, Codec AVC
MVXGRH	Matroska

TABLE 1

Question 1- 2 : Examination Questions	
WebCode	**Response**
NJRFJG	.MKV
PEG3MP	.mkv
PMAWE8	Matroska Version 4
QJBHTM	Matroska
RCZC4A	Matroska, webm
RWTNYC	matroska, webm
T4RKFX	MKV (Matroska)
TAVG4T	.mkv
TV9WF4	.mkv
U7AYH2	.mkv
URNB3M	H264/AVC
V8JJMG	matroska,webm
VQ83FE	.mkv (Matroska Video)
VV3UNC	Matroska (.mkv)
WCR6BE	MKV
WFRDFN	MKV (Matroska Video File)
XBQBKX	MKV
XR36KA	.MKV (Matroska Video format)
XYWBEB	Matroska (mkv)
Z3BRL7	Matroska (MKV)
ZQU3LF	MKV

Question 1-2: What is the container format?

Consensus Result: Matroska (MKV)

TABLE 1

Question 1- 3 : Examination Questions

Question 1-3: What is the reported frame rate of the video file (report as a numeric value in fps)?

Manufacturer's Expected Response: 7.5

WebCode	Response
24XPA3	7.5
2QBFPJ	7.5
36JKZE	7.5
3BCXA6	7.5
3D7J7G	7.500
3TUURJ	7.5
4AXDXY	7.5
4YG4D2	7.5
664CE7	7.5
9373XZ	7.5
9BBACZ	7.5
9F67Z7	7.5
A9U3U4	7.5
BD743R	7.5
D6RY6R	7.50
DMDYHR	7.5000
DRLJ64	7.5
DZ3VKP	7.500
EMDGYX	7.5
FBV4CQ	7.5
FFZL7N	7.500
FUHC6Q	7.5
GE6VJV	7.5
GELYAG	7.5
HEN2JL	7.5
HKAUTZ	7.5
JG6L2U	7.5
KWGGWG	7.5
L93DBK	7.500
L9EK4T	7.5
LWRMTH	7.5
MBNJ4F	7.5
MVXGRH	7.5

TABLE 1

Question 1- 3 : Examination Questions	
WebCode	**Response**
NJRFJG	7.5
PEG3MP	7.5
PMAWE8	7.5
QJBHTM	7.500
RCZC4A	7.50
RWTNYC	7.5
T4RKFX	7.5
TAVG4T	7.5
TV9WF4	7.5
U7AYH2	7.5
URNB3M	7.5
V8JJMG	7.50
VQ83FE	7.5
VV3UNC	7.5
WCR6BE	7.5
WFRDFN	7.5
XBQBKX	7.5
XR36KA	7.500
XYWBEB	7.50
Z3BRL7	7.5
ZQU3LF	7.500

Question 1-3: What is the reported frame rate of the video file (report as a numeric value in fps)?

Consensus Result: 7.5

TABLE 1

Question 1- 4 : Examination Questions

Question 1-4: Using the on screen timecode display for reference, how many frames are there for each second that passes in the video?

Manufacturer's Expected Response: 15, 15+ or 16

WebCode	Response
24XPA3	15
2QBFPJ	Variable, 12-16 FPS
36JKZE	15
3BCXA6	alternating between 8 and 7 fps
3D7J7G	15
3TUURJ	15 (average)
4AXDXY	15
4YG4D2	15
664CE7	16 (Approximate average by counting frames at beginning, middle and end of video - about 15 samples)
9373XZ	Usually 15 frames per second (but it varies, in first 12 seconds of video the number of frames dipped as low as 12 and occasionally reached 16)
9BBACZ	Varied from 12 to 16 fps in different segments of the video
9F67Z7	about 15 Fps
A9U3U4	The frame rates are mixed. The clip contains varying frame rates of 12, 13, 15 and 16fps
BD743R	15
D6RY6R	16 fps
DMDYHR	15
DRLJ64	approximately 15
DZ3VKP	frame rate is variable, 13-16 frames/second; the majority is 15 frames/second.
EMDGYX	15-18 (frames vary between seconds)
FBV4CQ	15
FFZL7N	7.500
FUHC6Q	15
GE6VJV	Video has a variable rate. Seconds have 16, 15, 13 or 12 frames.
GELYAG	about 15frame (Sometimes 10frame, 12frame, 13frame, 16frame were observed)
HEN2JL	15 FPS
HKAUTZ	15
JG6L2U	16 fps
KWGGWG	~15 (15.12)
L93DBK	Between 15 and 16 frames on every second, an average of 15.5
L9EK4T	15
LWRMTH	A visual count of the fps using randomly selected 1-second periods showed that the fps varied between 14 and 16; the periods counted erred toward 16 fps.

TABLE 1

Question 1- 4 : Examination Questions	
WebCode	**Response**
MBNJ4F	There are approximately 15 frames per second of the on screen timecode.
MVXGRH	15 frames
NJRFJG	15
PEG3MP	15 fps
PMAWE8	Approximately 15
QJBHTM	5
RCZC4A	16 FPS
RWTNYC	15
T4RKFX	15
TAVG4T	15
TV9WF4	15
U7AYH2	15-16 frames per second
URNB3M	/
V8JJMG	15
VQ83FE	Average of 15 frames, noted one time (04:22:09 PM) with 16 frames and one time (04:22:17 PM) with 12 frames.
VV3UNC	Different sections of the video clip were reviewed and showed some were 15 frames and some were 16 frames.
WCR6BE	16
WFRDFN	Details supplied in comments, but total number of frames was 674 (if the number of frames was being sought for the whole video file); if seeking an average, it was determined to be 14.8 (therefore 15 fps)
XBQBKX	15
XR36KA	12
XYWBEB	Manual counting for the first 10 s and last 10 s of the time stamp of the video was done, there is as low as 12 frames per second and as high as 16 frames per second. An average of 15.01 frames each second
Z3BRL7	Approx. 16
ZQU3LF	15 and 16

Question 1-4: Using the on screen timecode display for reference, how many frames are there for each second that passes in the video?

Consensus Result: 15 or 16 and range variations covering either of these responses.

TABLE 1

Question 1- 5 : Examination Questions

Question 1-5: What is the resolution of the video file?

Manufacturer's Expected Response: 1920x1080

WebCode	Response
24XPA3	1920/1080
2QBFPJ	1920x1080
36JKZE	1920x1080
3BCXA6	1920x1080
3D7J7G	1920x1080
3TUURJ	1920x1080
4AXDXY	1920x1080
4YG4D2	1920x1080
664CE7	1920x1080
9373XZ	1920x1080
9BBACZ	1920x1080
9F67Z7	1920X1080
A9U3U4	1920x1080
BD743R	1920x1080
D6RY6R	1920x1080
DMDYHR	1920x1080
DRLJ64	1920x1080
DZ3VKP	1920x1080
EMDGYX	1920x1080
FBV4CQ	1920x1080
FFZL7N	1920X1080
FUHC6Q	1920x1080
GE6VJV	1920x1080
GELYAG	1920x1080
HEN2JL	1920x1080
HKAUTZ	1920x1080p
JG6L2U	1920x1080 pixels
KWGGWG	1920x1080
L93DBK	1920x1080 (referencing MediaInfo)
L9EK4T	1920x1080 (FHD)
LWRMTH	1920x1080
MBNJ4F	1920x1080
MVXGRH	1920pixels x 1080pixels

TABLE 1

Question 1- 5 : Examination Questions	
WebCode	**Response**
NJRFJG	1920x1080
PEG3MP	1920x1080
PMAWE8	1920x1080
QJBHTM	1920x1080
RCZC4A	1920x1080
RWTNYC	1920x1080
T4RKFX	1920x1080 (pixels)
TAVG4T	1920x1080
TV9WF4	1920x1080
U7AYH2	1920x1080
URNB3M	1920x1080 pix
V8JJMG	1920x1080
VQ83FE	1920x1080
VV3UNC	1920 pixels x 1080 pixels
WCR6BE	1920x1080
WFRDFN	1920x1080 (16:9) pixels.
XBQBKX	1920x1080
XR36KA	1920x1080 (16:9)
XYWBEB	1920x1080
Z3BRL7	1920x1080
ZQU3LF	1920x1080 pixels

Question 1-5: What is the resolution of the video file?

Consensus Result: 1920x1080

TABLE 1

Question 1- 6 : Examination Questions

Question 1-6: Is there an audio track as an element of the video file?

Manufacturer's Expected Response: No

WebCode	Response
24XPA3	No
2QBFPJ	No
36JKZE	No
3BCXA6	No
3D7J7G	No
3TUURJ	No
4AXDXY	No
4YG4D2	No
664CE7	No
9373XZ	No
9BBACZ	No
9F67Z7	No
A9U3U4	No
BD743R	No
D6RY6R	No
DMDYHR	No
DRLJ64	No
DZ3VKP	No
EMDGYX	No
FBV4CQ	No
FFZL7N	Yes
FUHC6Q	No
GE6VJV	No
GELYAG	No
HEN2JL	No
HKAUTZ	No
JG6L2U	No
KWGGWG	No
L93DBK	No
L9EK4T	No
LWRMTH	No
MBNJ4F	No
MVXGRH	No

TABLE 1

Question 1- 6 : Examination Questions	
WebCode	**Response**
NJRFJG	No
PEG3MP	No
PMAWE8	No
QJBHTM	No
RCZC4A	No
RWTNYC	No
T4RKFX	No
TAVG4T	No
TV9WF4	No
U7AYH2	No
URNB3M	No
V8JJMG	No
VQ83FE	No
VV3UNC	No
WCR6BE	No
WFRDFN	No
XBQBKX	No
XR36KA	No
XYWBEB	No
Z3BRL7	No
ZQU3LF	No

Question 1-6: Is there an audio track as an element of the video file?

Consensus Result: No

Forensic Video Enhancement Responses

TABLE 2

Question 2- 1 : Enhanced Video Examination

Question 2-1: Note methods or tools used and settings for the video enhancement here.

Manufacturer's Expected Response: This was a free form question on methods and tools used. No manufacturer's response expected.

WebCode	Response
24XPA3	I tested my external write blocker using a control USB. The write blocker is working correctly. I then connected the evidence media through the write blocker and created a working copy on the hard drive of the forensic tower. I completed a SHA 1 hash of the original and a working copy of the media. The two files matched. I completed a verification of the Amped Five software using the "ColorBars-1Khz tone.avi" control file. The software is working correctly. The working copy was imported into the Amped Five software. I documented the working copy's screen resolution, frame rate, play duration, and video codec. Created an area of interest (AOI) between the video timestamps of 04:22:35 PM (Frame 544) and 04:23:56 PM (Frame 1758). I adjusted the frame rate from 7.5 fps to 15 fps, to match real-time play speed as much as possible. I cropped the AOI video to focus on the two subject vehicles to a screen resolution of 481/269. I adjusted the color levels, brightness, and contrast of the now cropped AOI video to the following: Highlight/White-61, Midtone/Gray – 31, Shadow/Black – 0, Brightness – 30, Contrast – (-6) I resized the cropped AOI video to double its current size to 962/538 while using the software to maintain the aspect ratio. I exported the result as a .mp4 video file with the visually lossless export option selected. I labeled the video file as "Final Video.mp4." I completed a final SHA 1 hash of "Final Video.mp4."
2QBFPJ	Test documentation was reviewed and a compressed (zip) folder was downloaded. The item was then archived according to laboratory policy, and verified using "TGTHash" which reported a MD5 hash value of 164D346DC1466C57194C641D166B5862. A working copy was also created and verified with a hash value comparison. File "23-5581_VideoMaterial.mkv" was extracted from the working copy for further examination. AmpedFIVE was used to review the file properties and observe the recording. The following settings were applied for enhancement: • Video was trimmed to frames 544-1758 using "Range Selector." • Video was cropped to display a portion of the upper right quadrant. • Frame was resized by 2x using "Smart Resize." • Video was further enhanced by applying the Brightness (-13) / Contrast (74) and Unsharp Masking filters. • Frame rate was adjusted to 15 FPS. • Video was saved in the "mp4" format using the H264 Codec with visual lossless quality (Video Writer). • All settings were saved within the Amped FIVE project. • Work product was archived according to laboratory procedures and verified.
36JKZE	I started by using 7zip to extract the MKV file from the zipped up folder. I then processed the MKV through Wondershare using the MP4 same as source setting as I was unable to directly import the MKV into my avid Media Composer edit suite. I then imported the resulting MP4 in to Avid using the resolution setting of DNxHD SQ. Once in Avid I then "time warped" the specific section by 197.37 % to give it a more realistic play back speed. I then used the "resize" effect to crop and enlarge by x2. After I had the correct section cropped and resized I then applied the "paint effect " filter and used the "colour Adjust " section to adjust the brightness and contrast. Once the enhancement work was finished I then exported it as a MXF file using the settings XDCAM HD 50Mbits. This file I then again transcoded through Wondershare using the MP4 same as source setting to create the final MP4 file.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
3BCXA6	Virtual Dub 2 -Add Frame#/Timestamp/Current Time: Timestamp=In, None=Out, Automatic Frame Position, Font Size=200%, Show Frame #=In -Trim from Frame 544 to 1758 -Export: AVI, Uncompressed RGB/YCbCr, RGB24 Axon Investigate -Crop Settings: Width=664, Height=469, x=1256, y=0 -Resize Settings: Width=1328, Height=938, Preset Sizes=X2, Interpolation Method=Bicubic -Levels Adjustment Settings: Range=0 to 59 -Output Settings: Transcode Video=H.264, Compression Quality=Lossless Compression, Frame Rate (Change Speed)=15
3D7J7G	Amped Five was used for the Video Enhancement. I trimmed the video from frame 544 (screen time of 04:22:35) to frame 1758 (04:23:56). This equated to a time span of 1 minute and 20 seconds. I could see the video was not moving at 'real' time and the length of the video playing was 2 minutes and 41 seconds. Using the screen timecode I counted the amount of frames per second to 15. I adjusted the frame rate to 15 frames per second and could see the video was now playing back at a more realistic speed. The duration of the video was now 1 minute and 20 seconds which corresponded with my earlier calculations. I cropped the video to concentrate on the two vehicles in the top right hand corner (Crop 1). The crop did mean the time and date were no longer showing on the footage. After the crop I used the resize filter and enlarged the footage using a zoom of 2. I ensured the resized video kept the same aspect ratio of the crop measurements I had used. The bicubic interpolation was used as this provides a good visual output. The video was quite dark so the Levels Filter was used to adjust the footage to a more realistic brightness. As the time and date were no longer showing on the cropped footage I cropped the original video again to just show the time and date (Crop 2). The same footage range and frame rate were used as Crop 1. I used the Picture in Picture filter to incorporate Crop 1 and Crop 2. This enables the viewer to see the cropped footage along with the time and date of the video footage. From frame 128 until frame 1057 I added a magnify filter to the 'Picture in Picture' footage. The magnifier assists the viewer by showing the interactions with the two people at the front car. The filter annotates to the zoomed in footage and area being magnified. I exported the final sequence as an MP4 video with an H264 lossless CODEC.
3TUURJ	programm "Amped FIVE" (Revision: 26914); Contrast Brightness (add 75 Contrast, add 96 Brightness, Mode: Linear); Blind Deconvolution (Size: 3, Iterations: 26, Noise: 1).
4AXDXY	1. FFMPEG to rewrap the contents of the mkv container into an mp4 container compatible with Premiere Pro. 2. Import into Premiere Pro. 3. Clip footage in source window, Playhead Position set to show frames instead of duration to verify correct start/end frames. 4. Speed/duration set to 200%, sequence set to 25 fps 5. Crop tool used to crop in to top right corner of the video. Values Left = 50%, Bottom = 50% 6. Scale set to 200%, Position set to 0.0, 1080.0 7. Lumetri Color tool used to correct levels. Exposure +5, Contrast +50
4YG4D2	7/10/2023 Downloaded "23-5581_VideoMaterial.MKV" from CTS. 7/11/2023 A) Loaded MKV into Amped Five. Trimmed segment to frames 544 - 1758. B) Adjusted to 15 FPS. C) Cropped to focus on individual(s) of interest. D) Levels (66 / 33 / 0). E) Resize X2. F) Saved adjusted video as MP4 / H264 / 15 FPS / Visually Lossless

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
664CE7	Axon Investigate 3.2.2 was used to extract a subclip from frame number 544 to 1758 as requested in the test instructions. The video was trimmed slightly longer in front and back so there would be enough frames to get the requested start and end point. When the subclip was output using "Standard Output", the levels were adjusted with the settings 0, 113.5 and at the same time correct the playback speed to 15fps. The setting of best performance was selected. Premiere Pro v23.6 was used to enhance / clarify the video further and trim the video. Lumetri settings are as follows: Basic Correction - White Balance Temperature - 4.0, Tint - 0.0, Saturation - 100.0, Exposure - 1.1, Contrast - 0.0, Highlights - 10.0, Shadows - 45.0, Whites - 0.0, Blacks - 0.0 Effect Controls – Motion Position - 0.0 / 1030.0 Scale - 200.0, Anchor Point - 960.0 / 540.0
9373XZ	VirtualDub (build 44282) was used for trimming and cropping. (No clarification or scaling.) FFMPEG (version 5.1.1) was used for adjusting frame rate. (The following command set the duration of the frame 544-1758 subclip at precisely 1 min 20 secs: ffmpeg -i input.avi -c:v rawvideo -vf "setpts=0.493" output.avi) AmpedFive (revision 29850) was used for clarification. The Retinex filer was used to adjust the brightness and contrast. The background (main) video used Retinex at 4 iterations, while the 12x zoom picture-in-picture used Retinex at 1 iteration (lighter). All resizing utilized nearest neighbor interpolation. The output file was rendered as an H.265 MP4 video using AmpedFive's "visually lossless" quality setting.
9BBACZ	Examined the test MKV video file with MediaInfo v.23.06 and VLC Player v.3.0.16 for metadata. Used common video players (VLC, MPC-HC and WMP) for visual examination of the video file. The video file appeared to be underexposed and playing at a slower frame rate. Elected to use Axon Investigate v.3.2 software to interrogate, clarify and enhance the video file. Uploaded the video file and examined the options for adjusting the frame rate, clipping the requested segment, adjusting the exposure, and cropping to the area of interest. Output to MP4 video format. Single View Video Workflow: Levels Adjustment – minimum = 0; maximum = 64 Crop – (x, y) = (960, 0); size = 960x540 Resize – size = 1920x1080; Bilinear Standard Output – best performance; frame rate (change speed) = 15

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
9F67Z7	QuickHash v3.2.0 to get the SHA for question 1-1 Amped FIVE – Build date: 20220428 – Revision: 24474 Chain Video Loader - Loads a video from file. Details: The Video Loader tool renders a video file that can be encoded in a variety of standard formats to a sequence of bitmaps that can be displayed and processed. Parameters: File: 23-5581_VideoMaterial.mkv Path of the video to load. Video Engine: FFMS Video decoder to use. Color Range: Full Use the color range specified in the video file or force it to full or limited (16-235). Works only with the FFMS Video Engine. Audio Stream: None Audio Stream selection, useful when more than one are available. Original File: Original video file that has been converted from a proprietary DVR format. Additional Information: Video Streams: 1 Number of video stream in the video Audio Streams: 0 Number of audio stream in the video Subtitle Streams: 0 Number of subtitle stream in the video Range Selector - Selects frames of the video within an interval with an optional step. Support the trimming of the original video stream without transcoding. Details: The Range Selector tool outputs a video of specific frames that are part of the input video. Parameters: First Frame: 544 First frame of the selection of interest. Last Frame: 1758 Last frame of the selection of interest. Step: 1 - Take only one frame every Step frames. Additional Information: This filter has no additional information. Levels - Adjusts intensity and color levels. Details: The Levels filter maps the values of the input image to the values of output image according to a piece-wise linear transformation controlled by the values of Highlights, Midtones and Shadows. The Midtones slider changes the intensity values of the middle range of intensity levels without significantly changing the highlights and shadows in the image. The Highlights and Shadows sliders set the black point and the white point of the image. Each channel of the input image is configured using the sliders of the corresponding parameter: Value, Red, Green or Blue. For each parameter, the histogram of the tonal range of the input image is displayed. If the input image is in grayscale, changing the setting of Red, Green and Blue parameters has no effect on the output image. Parameters: Value: 64, 12, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the grayscale converted image. Red: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the red channel of image. Green: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the blue channel of image. Blue: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the green channel of image. Selection: Whole Image Selection where the filter is applied. It may be the whole image, a static region, or a region containing a

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
	tracked object of interest. Additional Information: This filter has no additional information. References: Anil. K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall, pp. 234–241, 1989. ISBN: 0-13-336165-9. Crop - Crops a region of interest of the image. Details: The Crop tool produces an output image which is only the selected region of the input image. Parameters: Selection: x: 1418, y: 301, w: 320, h: 202 Selection where the filter is applied. It may be the whole image, a static region, or a region containing a tracked object of interest. Additional Information: This filter has no additional information. Resize - Resizes the image. Details: The Resize tool interpolates the input image by generating an output image of the desired size. The available interpolation algorithms are: - Nearest: simply copies the value of the closest pixel in the position to be interpolated; - Bilinear: uses a bilinear interpolation to resample pixel data; - Bicubic: uses a bicubic interpolation to resample pixel data. - Area resamples using pixel area relation. - Lanczos uses a Lanczos interpolation to resample pixel data. Parameters: Size: 640, 404 Size of output image in pixels. Interpolation: Bicubic Interpolation algorithm. Additional Information: This filter has no additional information. References: Anil. K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall, pp. 253–255, 1989. ISBN: 0-13-336165-9. Anil. K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall, pp. 320–322, 1989. ISBN: 0-13-336165-9. R. Keys, “Cubic convolution interpolation for digital image processing”, in IEEE Transactions on Acoustics, Speech, and Signal Processing, Vol. 29, No. 6, pp. 1153-1160, December 1981. https://doi.org/10.1109/TASSP.1981.1163711 Hsieh Hou and H. Andrews, “Cubic splines for image interpolation and digital filtering”, in IEEE Transactions on Acoustics, Speech, and Signal Processing, Vol. 26, No. 6, pp. 508–517, December 1978. https://doi.org/10.1109/TASSP.1978.1163154 Video Writer - Writes the current video to a file. Details: The Video Writer tool encodes all frames of the current video to the specified video file format. Parameters: File: 23-5581_VideoMaterial-230801164329.mp4 Path of the file to save. Format: mp4 - H264 Container and codec used to write the video file. Frame rate: 15 Frame rate (in frames per second) of the output video. Note that some video formats support only a limited set of frame rates, and the frame rate may influence some properties of the output video (e.g. the GOP size) for some codecs. Quality: Visually Lossless If a codec has been selected that allows quality control, the following options can be selected: Default: Uses a Constant Rate Factor of 18 High: Uses a Constant Rate Factor of 12 Visually Lossless: Uses a Constant Rate Factor of 1 HW Acceleration: None

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
	Allows selecting a video encoding acceleration hardware. Actual availability will be tested when the filter is applied. Additional Information: Video Streams: 1 Number of video stream in the video Audio Streams: 0 Number of audio stream in the video Subtitle Streams: 0 Number of subtitle stream in the video
A9U3U4	Adobe Premiere, Brightness & Contrast effect added: 100% Brightness, 75% Contrast. Modified frame rate to 15fps. Output settings: H.264 1920x1080, 15fps, Progressive, VBR 2 Pass, Target 40Mbps, Max 40Mbps
BD743R	Video was played back in VLC to assess the actual frame rate of the video by scrolling frame by frame. Video was approx 15fps. File was converted to prores 422HQ MOV in shutter 16.2 in order to play back in Adobe Premiere Pro 22.6.2. A sequence was created initially to match the source details so that the required start and finish frames could be found and the video clipped. Once this was done, A sequence was then created in Adobe Premiere Pro (Version 22.6.2 build 2) with the following settings: 1920x1080, square pixels, 30fps, Rec.709. In premiere, a black video was created and added before and after the clip. Text titles were also created for V-1316-23 and ''End''. A splash screen was added at the start of the sequence with a disclaimer and screen calibration image. The clip was added to the timeline and resized to fit the 1920x1080 window. The instructions as supplied in the examination details were followed; the clip was trimmed at frame 544 (04:22:35) and again at 1758 (04:23:56). The video was then sped up by 200% to match real time. A crop effect was added to the top right quarter of the screen, and the image was then expanded by 2x to fill the full preview window. A lumetri colour effect was added to adjust brightness/contrast of the video - it was also important to note that it appears the video has been purposefully darkened as the time counter on the top right was darkened also. This is unusual as this is usually overlaid onto the video separately and should be white regardless. The exact details of all these changes are present in the premiere file. The video was exported in 1920x1080 (1080p) resolution in a "QuickTime Master Pro Res 422 HQ" format, 30fps, progressive, uncompressed, 48000 Hz stereo, 16 bit. The file was then imported into shutter encoder with the following settings: H264 MP4, same source scaling, CBR @ 15000kb/s, 256kb/s audio, 2 pass.
D6RY6R	On Amped FİVE 1- RANGE SELECTOR 2- EXPOSURE 3- CROP 4- SMART RESİZE 2X 5- VİDEO WRİTER (16 FPS H264 CODEC .MP4)
DMDYHR	Imported the video file into AmpedFive and obtained video properties. Selected the area of interest between frames 544 - 1758. Changed the frame rate to 15fps in order to play back as close to real time as possible. Cropped the video and enlarged to display the area of interest to include the date/timestamp. Utilized the Levels filter to adjust the Highlights, Midtones, and Shadows within the video. The parameters are as follows: Value - 65, 32, 0. Red - 255, 127, 0. Green - 255, 127, 0. Blue - 255, 127, 0. Applied a Global Stabilization filter to stabilize the overall scene.
DRLJ64	I used Amped Five (Revision 28265) software and performed the following processes to clarify the video: Exposure: +1.8 Levels: 0, 85, 225 Parametric curves: Highlights 0 Lights 0 Darks +35 Shadows +60
DZ3VKP	Amped FIVE Revision: 28265 was used to adjust the exposure to 1.7500 and levels were adjusted to 215,60,0.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
EMDGYX	Axon Investigate v3.0.0 was used to interrogate the original video file. A subclip was created to trim the video to its requested time duration. The "Crop" filter was used to crop the video to enhance the area around the suspects. The "Levels Adjustment" filter was used to improve the contrast of the video to make it easier to view (lower range: 2.6, upper range: 65.8). The 2X option in the "Resize" filter was used to enlarge the cropped video by 2 times. Finally the "Output to mp4" option was selected and lossless compression was used to save the file in an .mp4 format.
FBV4CQ	Tools: - Media Info (v.21.09) – for file information - Amped FIVE (24474) – for video processing Processes: - Import Video (Engine – FFMS) - Select range (Frames: 544 – 1758 inclusive) - Change Frame Rate (reported 7.5) to 15 fps - Crop – Top right corner to include vehicles and date and time Selection: x: 1277, y: 0, w: 643, h: 450 - Curves filter – to adjust levels – increase dark areas Value: x: 1, y: 0 x: 33, y: 173 x: 64, y: 217 x: 145, y: 246 x: 185, y: 249 x: 255, y: 255 - Smart Resize x 2 (bicubic) – to 1610x1128 - Video Writer: as .mp4/H.264/'Visually Lossless'/15 fps saved as : '23-5581_VideoMaterial-processed_V2.mp4'
FFZL7N	Starwitness FreezeFrame software Settings: Deinterlacing: Interlaced Spotlight: Off Stabilization: Off Zoom: 202% Zoom Offset: 969 545 Brightness: 54 Contrast: 26 Sharpness: 0.09 Frame Average: Off Rotation: 0 Speed: 200%
FUHC6Q	Video was trimmed from frame 544 to 1758 without reencoding, using VirtualDub2. A new resulting video was saved. The framerate was changed from 7.5 FPS to 15 FPS without reencoding by modifying the "frame default duration" flag, using MKVToolNix. A new resulting video saved. The following steps were taken using Amped FIVE: - Cropped the image with selection values: x: 1171, y: 19 | w: 720, h: 480 - Curves adjustment, values: x: 0, y: 30 | x: 6, y: 56 | x: 52, y: 200 | x: 65, y: 255 - Temperature / tint adjustment, values: Exposure Correction (EV): 0.3000, Color Temperature (Kelvin): 8156. - Resize to 1440 x 960 (2x) using Nearest interpolation method. - A new resulting video was saved as .mp4 with h264 codec using a CRF of value 1 (visually lossless).
GE6VJV	Using Axon Investigate version 3.2.3 the frame rate was adjusted to 16 fps. The frame was cropped to the following settings: (x, y) = (964, 0); size = 956x526 Levels Adjustment was set to minimum = 0; maximum = 127.8 Resize- 2X size = 1912x1052; Bicubic. Output to MP4 – transcode video = H264; no compression. File Name: f544-f1758-16fps.mp4

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
GELYAG	- (using Amped Five) Curves(adjust the medium brightness value), Deblocking techniques - (using After Effects) Partially magnified the video respectively using Curves+Deblocking, Temporal Smoothing, and Motion Smoothing techniques, and placed it in the video
HEN2JL	The file 23-5581_VideoMaterial.mkv was loaded into Amped FIVE and examined. Amped FIVE range selector was used to isolate the time of interest and frames 544 to 1758 were selected. The frame rate was adjusted to 15 fps. The footage was cropped to the area of interest in the upper right corner of the camera view and includes the time stamp. Clarification filters, levels and exposure, were applied to increase the visibility of the footage. The footage was enlarged 2x bicubically and a visually lossless .mp4 video was exported from Amped FIVE.
HKAUTZ	All video work carried out in AMPED 5. Filters applied: Change Frame rate :15 Histogram Equalisation (to brighten video) and ignore black pixels options selected to boost brightness Output file saved as MP4 H265 (visually lossless option selected from within AMPED 5)
JG6L2U	Using Axon Investigate v 3.1.0, I set the inpoint at the first frame of 4.22.35 PM. Set the outpoint to the first frame of 4.23.56 PM. Made subclip. Did levels adjust to make brighter. Exported the same subclip twice and brought back into Axon Investigate. Cropped one of the subclips and then resized it 2x. Placed the two subclips onto a canvas. Exported it as a lossless mp4 video with a 16 frame per second rate.
KWGGWG	Amped Five v28265, Retinex filter, iterations: 5
L93DBK	Amped FIVE: I loaded the video, used range selector to create a video segment from frame 544 to frame 1758, cropped the video to show the top right quarter, adjusted the exposure to clarify the image, resized the video and saved the video as a .mp4 – H264 visually lossless.
L9EK4T	Amped Five Histogram colour changes through 'levels filter' Levels value = Highlights from 255 to 80, Midtones from 127 to 40 Red/Green/Blue - Highlights 255, Midtones 127, Shadows 0 'Deblocking filter' used for compression artifact improvement = Strength 3.6 'Laplacian Sharpening' used for pixel contrast enhancement - Intensity strength 0.0600 Range selector used to isolate the clip of footage (frames 544 to 1758 = 1214 frames total) Framerate set to 15fps Cropped Image - selection x: 1409, y: 248 (Resolution 404x295) Smart resize used - x2 (New resolution 808x590) Audio stream checked and not found within container Output to H264/MP4 - Visually Lossless setting (CRF of 1)

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
LWRMTH	The requested video was downloaded per instructions and verified as correct by comparing its current hash value to the hash sum provided in the instructions. The video was initially assessed using MediaInfo v22.06; the resulting information was saved in the Crime lab's case management system. The video was uploaded into Axon Investigate v3.2.3 software. The video was clipped to the requested scope of interest. The video played at 7.5 fps; however, a visual count of the fps using randomly selected 1-second periods showed that the fps varied between 14 and 16; the periods counted erred toward 16 fps. The video was then set to replay at 16fps to more accurately display the video. The resolution of the video is 1920x1080. As per the instructions, the area of interest was cropped to 960 x 540 using the top right corner as the crop anchor point. The overall appearance of the video was dark; therefore, a simple adjustment of the levels was made using the levels adjustment tool within Axon Investigate software. The levels were set to Minimum = 0: Maximum = 68. Per the instructions, the cropped video was enlarged by a factor of x2 (1920 x 1080) and output as a visually lossless .mp4 file. Methodology · The zipped Video file was downloaded as per the instructions · The zipped file was hashed using QuickHash v3.2.0 · Hash sum verified against provided hash sum · The video file was extracted from the zipped folder, hashed, and verified using QuickHash v3.2.0. · The video was uploaded to MediaInfo v22.06 · MediaInfo file placed in the lab's case management system · Video file imported into Axon Investigate v3.2.3 · Video clipped to specified times · A visual count of the fps using randomly selected 1-second periods showed that the fps varied between 14 and 16; the periods counted erred toward 16 fps. · The video frame rate set to play at 16 fps · Video cropped per request (960x540) · Levels adjusted · Video resized by a factor of x2 using Bi Cubic interpolation (1920x1080) · Video viewed and assessed for the number of times an action took place · The resulting file was output as visually lossless .mp4 · Axon Investigate workflow history file placed in the lab's case management system
MBNJ4F	I used Amped FIVE to open the video, adjust brightness/contrast, crop, select a time range, resize, and the output the result as an MP4 video file with visually lossless H264 compression.
MVXGRH	23-5581_VideoMaterial.mkv was opened in Amped FIVE. Frames 544 through 1758 were isolated and the frame rate was adjusted to 15fps. The video was then cropped to the upper right quarter of the frame. Using FIVE the video was enhanced by using the deblocking and exposure filters (increasing the exposure). The cropped video was resized 2x, using bicubic interpolation. The enhanced video was saved with the following settings; Container: mp4, Video Codec: H264, Frame Rate: 15, and Quality: Visually Lossless.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
NJRFJG	TOOL USED: Amped FIVE Report Generation: 2023-06-22 09:26:50 Project Name: Author: Description: Software version info: Build date: 20230315 Revision: 28265 Platform: Operating System: Microsoft Windows, 64 bit CPU Model: Intel(R) Core(TM) i9-10900KF CPU @ 3.70GHz Project File: 23-5581_VideoMaterial_NN.afp METHODS 23-5581_VideoMaterial Video Loader: Loads a video from file. Range Selector: Selects a range of frames in a video. Supports the trimming of the original video stream with no transcoding. 23-5581_VideoMaterial-trimmed-230620132747 Video Loader: Loads a video from file. Change Frame Rate: Changes the frame rate of the video. Crop: Crops a region of interest of the image. Levels: Adjusts intensity and color levels. Resize: Resizes the image. Video Writer: Writes the current video to a file. Range Selector - Selects a range of frames in a video. Supports the trimming of the original video stream with no transcoding. Details: The Range Selector tool outputs a range of frames from the input clip. Parameters: First Frame: 544 First frame of the selection of interest. Last Frame: 1758 Last frame of the selection of interest. Step: 1 - Outputs only one frame every Step frames. Change Frame Rate Changes the frame rate of the video. Details: The Change Frame Rate tool changes the update frequency of a video during playback. Parameters: Frame Rate: 29.9700 Frame rate of the output video. Total Time: 00:00:40.874 Total time of the output video. Crop Parameters: Selection: x: 1256, y: 6, w: 640, h: 480 Levels - Adjusts intensity and color levels. Parameters: Value: 67, 33, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the grayscale converted image.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
	Red: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the red channel of image. Green: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the green channel of image. Blue: 255, 127, 0 Highlights, Midtones and Shadows settings used to map the pixel values of the blue channel of image. Selection: Whole Image The selection where the filter is applied to. It may be the whole image, a static region, or a region containing a tracked object of interest. Resize - Resizes the image. Details: The Resize tool interpolates the input image by generating an output image of the desired size. Parameters: Size: 1280, 960 Size of output image in pixels. Interpolation: Nearest Interpolation algorithm used when the image is resized. Video Writer - Writes the current video to a file. Details: The Video Writer tool encodes all frames of the current clip to the specified video file format. Parameters: File: ../Derivatives/NN/23-5581_VideoMaterial-trimmed-230620132747-230621105157.mp4 Path of the file to save. Container and Video Codec: mp4 - H264 Container and codec used to store the media stream(s). Frame rate: 29.9700 Quality: Visually Lossless
PEG3MP	Used Amped FIVE to do the following enhancements/clarifications: • Trim from frame 544-1758 • Changed frame rate to 15 fps • Cropped out area of interest but kept the area with the time/date stamp • Did a levels adjustment • Enlarged video 2x • Wrote out the video as a visually lossless .mp4 with a CRF of 1 (file name: 23-5581_VideoMaterial_EnhancedClip.mp4)
PMAWE8	Imported working copy of the video into Amped FIVE - Range Selector: frame 544-1758 - Change Frame Rate: 15 - Crop - Levels: Highlights: 69; Midtones: 29; Shadows: 0 - Unsharp Masking: Strength: 0.25; Size: 25; Threshold: 0; Mode: Intensity - Resize: Zoom: 2; Interpolation: Bicubic

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
QJBHTM	Tools used: Shotcut (ver 23.07.29) Cut the frame from 04:22:35 to 04:23:56 based on the upper right screen with a cut function to cut to a specific frame/time The value of Properties-Speed was modified to 2.00x to play in close real time. In order to double the speed of the video, the speed setting value was set to 2.000000x in the properties menu. The Filter menu was used for Enhance/clarify. 1) The video was cropped by setting the position (1168, 0) and size 752*561 as Crop: Rectangle. 2) 200% brightness, 3) 150% brightness additional improvement, 4) The setting value of Size, Position & Rotate was set to Position (-1,912, -25), and Size 3,840x2,160, Zoom 200.0%. 5) Contrast was set to 60.0% so that the image could be seen better. In order to store enhanced videos in .mp4 format using a constant rate coefficient (CRF) with no or low visual loss, the format was set to H.264 High Profile in the Export menu, and the format was set to mp4 and Quality was set to 99% (where the crf value was set to 1).
RCZC4A	On AMPED FIVE 1- Range Selector 2- Crop 3- Exposure 4- Smart Resize (2x) 5- Video Writer (Frame Rate changed to 16FPS and video saved H.264 codec MP4 file format)
RWTNYC	Amped FIVE (software) Steps: Hash Code; Range Selector (frames) 544 – 1758; Change Frame Rate 15fps; Crop: right corner; Auto Color Equalization; Smart Resize 2x; Unsharp Mask; Video Writer
T4RKFX	Amped Five: Hash Code/ File Info/ Range Selector/ Crop/ Retinex/ Smart Resize/ Averaging Filter/ Video Writer
TAVG4T	Contrast / Brightness Adjust: Contrast at 163%, Brightness at 181%
TV9WF4	Video was brought into Amped FIVE v25587 for examination. A levels adjustment was applied to correct the poor lighting hindering visibility • Highlights: 65. • Midtones: 32. • Shadows:0 The frames per second were manually counted using the on-screen timestamp by counting the number of frames before the seconds changed over (i.e. 4:22:40 to 4:22:41). 15 frames passed before the second hand changed over. The fps was corrected from 7.5 to 15. The video was cropped to show the interaction in the upper right-hand corner. The cropped region of the video was resized X2 using bicubic interpolation. Unsharp masking was applied to slightly increase the contrast in the video • Strength: .1900. • Size: 99. • Threshold: 0 The annotate filter with the magnification option was used to create a zoomed in picture-in-picture of the hand to hand interactions. The video was exported as a MP4 container with the h264 codec using a Constant Rate Factor of 1.
U7AYH2	Frame rate changed to 15fps, Levels adjusted to Highlights 67, Midtones 33, Shadows 0
URNB3M	Range selector; Change frame rate; Crop; Levels; Laplacian sharpening; Resize
V8JJMG	Using the tool of Visystem Video Analysis 5.0.1, firstly, the color scale of the whole screen was adjusted to the bright state, and then the human activity area was set as the ROI area, and then the gamma correction coefficient of 2.29 was performed on the roi area.

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
VQ83FE	Tools Used: Axon Investigate 3.2.2, VLC 3.0.18 Process: 1. Noted that frame 544 when viewing in Axon Investigate was the last frame of 04:22:34 PM and frame 1758 was the last frame of 04:23:56 PM. Elected to trim video based on the requested timestamps rather than the frame numbers listed in the request. 2. Marked subclip in Axon Investigate 3. When exporting file from Axon Investigate, the subclip did not export the correct frames. To correct for this a longer subclip was created and exported as a lossless subclip. 4. Cropped video frame to 853x520 (top left corner of crop at position 1067, 0) 5. Levels adjustment applied (Minimum 0, Maximum 60) 6. Enlarged video to 200% original size (853x520 to 1706x1040) using bicubic interpolation. 7. Output video as .mp4 file using H264 codec, compression quality set to 0 (lossless), frame rate adjusted to 15 frames per second (using change speed, no frames added/removed) 8. Confirmed playback of video file with VLC
VV3UNC	Used Axon Investigate to trim the video, adjust the frame rate, cropped, and resized the video. Amped5 was used to enhance the video. The steps below are in order with the tool that was used. 1. (Axon Investigate) - Trim video: Video was trimmed using the requested frames and video was saved on the DFU server as “trimmed.mp4.” 2. (Axon Investigate) - Adjusted frame rate: Video frame rate was adjusted to 15fps. See my notes for specific settings. Video generated was saved on the DFU server as “adjustedfps.mp4.” 3. (Axon Investigate) - Crop: video was cropped to 219 x 179, located at 1475 (x-axis) and 283 (y-axis). Video generated was saved on the DFU server as “cropped.mp4.” 4. (Amped5) – Enhance: video was contrast/brightness and Retinex was adjusted. Video generated was saved on the DFU server as “en-hanced.mp4.” - Contrast/brightness setting: Contrast (35), Brightness (79) - Retinex setting: 6 5. (Axon Investigate) - Resize: video was resized 2x. Video generated was saved on the DFU server as “resized.mp4.”
WCR6BE	Axon Investigate (3.2.2) : Crop (640 x 480, X1280 Y0), Resize (X2 with Nearest Neighbor), Levels (0,75), and output to MP4 using H.264 (compression quality = 0, frame rate = 16)

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
WFRDFN	Software Used with version numbers: PotPlayer (v 230705(1.7.21952), Adobe Premier Pro CC (v 23.5.0 (build 56) and FormatFactory X64 (v 5.14). On attempting to import the video file into Adobe Premier Pro CC, an error caption appeared stating 'The file has an unsupported compression type'. As such I used Format Factory to convert the file format to MP4. I compared the resolution and file size of the converted video file with that of the source file and found that the resolution were the same but the file size had been reduced from 506 MB to 156 MB. The MP4 version of the file was imported into Adobe Premier Pro CC and on doing so found that the file did not have an audio track. Trim - The file was trimmed to the first frame of time stamp 04:22:35 pm until the first frame of time stamp 04:23:56 pm. Change of frame rate to correct run speed – As the indicted (ie time stamp) elapsed time is two minutes fifteen seconds (a total of 135 seconds) and the file run time is four minutes twenty-eight seconds (a total of 268 seconds) this is a percentage change in speed of 198.52% to make the footage run at near real time. I therefore changed the speed duration of the trimmed file to 198.52% to bring the run time to very close to normal speed. Crop – I then cropped an area of the top right of frame showing the two vehicles increasing the scale to 400 and re-centering the position to the values of -1551.0 and 1139.0 (under 'Motion'). Enhance/Clarify – I then increased the brightness by 95 and the contrast by 70 (using the Brightness & Contrast tool). I then rotated the image to -8 to straighten it up (under 'Motion') but then to keep the cars in the center of frame readjusted the position to -1478.0 and 1493.0 (under 'Motion'). Enlarge – I then used the Magnify tool to enlarge the cars to x2 the stated magnification level from 150 to 300 and readjusted the box size to 280 and the center position to 1575.0 and 389.0. Export – The file was exported as an MP4 format video file titled 'Edit- 23-5581_VideoMaterial' using the maximum render quality tick box (found under 'Video' drop down menu then the 'More' drop down).
XBQBKX	FFMPEG?FFPROBE used to verify properties of video file and check for audio track presence - no audio detected. Video file processed via AmpedFIVE build 29850. Video appears slow. Reports 7.5FPS. Difference between OSD at in A (above) is 1:21. Frame Rate converted to 15FPS which appears to now play back at correct speed. Above MKV file imported into AmpedFIVE. Visualy the footage appears to be very dark. Appears to be CCTV footage overlooking a roadway beside a wooded area. Range selector filter applied to restrict playback to the relevant section of file. Change Frame Rate filter applied to correct playback speed. Crop filter used to focus on region of interest, top right hand side where the vehicles are parked. Smart Resize filter applied to zoom in on area of interest. Levels filter applied to stretch histogram and brighten overall image. Video Writer used to render resultant to a MP4 files. There appears to be 6 "hand to hand" transactions via the drivers window. However, this would be verified by investigator as not the role of the examiner to determine.
XR36KA	Axon Investigate using Crop (960W x 540H, x=960 y=0), Levels Adjustment (Range 0-64), and Resize (X2, Nearest Neighbor).

TABLE 2

Question 2- 1 : Enhanced Video Examination	
WebCode	**Response**
XYWBEB	Amped FIVE software was used. Build date 20230315 Revision: 28265 1) Range Selector filter was used to segment the frames of interest: frame 544 as 1st frame and frame 1758 as last frame 2) Change Frame Rate filter was used to output the frame rate to 15, total time 00:01:21.000 3) Crop filter was used on the area of interest. x : 1382. y : 245. w : 396. h : 209 4) Levels filters was used to adjust the intensity and colour levels Parameters: Value: 66, 33, 0. Red: 255, 127, 0. Green: 255, 127, 0. Blue: 255, 127, 0 Selection: Whole image 5) Resize filter was used to enlarge the video by 2x. Parameters: Size: 792, 418. Interpolation: Nearest. 6) Add text and annotate filter was then used on the frames 7) Picture in picture filter was used to combine the enhanced video with the cropped time stamp video 8) Video writer filter was used to export the enhanced video in .mp4 format Parameters: Container-codec: mp4 - H264 Frame rate: 15 Quality: Visually loseless
Z3BRL7	Using Amped FIVE, I opened the provided file. I applied the Range Selector, trimming the video file down to starting at frame 544 and ending at frame 1758. I used the Change Frame Rate filter to adjust the video frame rate. I then applied Crop to the top right portion of the video frame. I Resized the video by 2x. I then applied the Levels and Exposure filters. Lastly, I applied the Video Writer filter to write the video as MP4 visually lossless.
ZQU3LF	A) Note: two software programs counted varying frame numbers for the first frame at the specified times. iNPUT-Ace 2.8 counted frame #545 and Video Focus Pro 11.1 counted frame #547 as first frame at 04:22:35, instead of #544. Trimmed end of video in VFP frame #1762 to end. 1st frame at 04.23.56pm was #1761, instead of #1758. Then trimmed beginning in VFP frames #1-546 because #547 starts 04:22:35. B) 15fps C) Crop top right D) Levels adjust in VFP Input range 0-255 to output 10-215, gamma 1 to 0.726 E) Changed frame size (constrain pixels) 960w x 540h to 1920w x 1080h F) Saved video .mp4 format, visually lossless. Video Focus Pro software had limited quality options.

Question 2-1: Note methods or tools used and settings for the video enhancement here.

Consensus Result: This was a free form question on methods and tools used. No consensus response expected.

TABLE 2

Question 2- 2 : Enhanced Video Examination

Question 2-2: How many times do you see something being passed from one person to the other during the interaction?

Manufacturer's Expected Response: 6 or 7

WebCode	Response
24XPA3	6
2QBFPJ	6
36JKZE	10
3BCXA6	6
3D7J7G	7
3TUURJ	6
4AXDXY	6
4YG4D2	7
664CE7	6
9373XZ	6
9BBACZ	6
9F67Z7	6
A9U3U4	6
BD743R	6
D6RY6R	7
DMDYHR	6
DRLJ64	6
DZ3VKP	[Participant did not return results for this question.]
EMDGYX	6
FBV4CQ	4
FFZL7N	6
FUHC6Q	6
GE6VJV	6
GELYAG	6
HEN2JL	6
HKAUTZ	6
JG6L2U	6
KWGGWG	[Participant did not return results for this question.]
L93DBK	6

TABLE 2

Question 2- 2 : Enhanced Video Examination	
WebCode	**Response**
L9EK4T	6
LWRMTH	6
MBNJ4F	6
MVXGRH	6
NJRFJG	6
PEG3MP	6
PMAWE8	6
QJBHTM	6
RCZC4A	7
RWTNYC	6
T4RKFX	6
TAVG4T	6
TV9WF4	6
U7AYH2	6
URNB3M	6
V8JJMG	6
VQ83FE	6
VV3UNC	6
WCR6BE	6
WFRDFN	6
XBQBKX	6
XR36KA	6
XYWBEB	6
Z3BRL7	6
ZQU3LF	6

Question 2-2: How many times do you see something being passed from one person to the other during the interaction?

Consensus Result: The consensus response was "6" at 88% but "7" was also accepted.

Forensic Video Enhancement Observations

TABLE 3

Part 2: Video Enhancement Instructions - Perform the tasks listed below and provide an enhanced derivative video for review.

A. Trim the video so it starts at frame 544 - the first frame of time stamp 04:22:35 PM, and ends at frame 1758 - the first frame of time stamp 04:23:56 PM.

B. Adjust the frame rate so that it plays back as close to real time as possible.

C. Crop the video in at least to the top right quarter of the frame. You can crop closer into the subjects if you want.

D. Enhance/clarify the video. Use any methods or software tools deemed necessary to improve the viewers ability to see and or understand what is happening in the scene. Note the method or tools used and settings below

E. Enlarge your new cropped video by 2x.

F. Save your enhanced video in .mp4 format with a visually lossless or low constant rate factor (CRF).

WebCode	Observational Notes
24XPA3	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
2QBFPJ	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
36JKZE	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: File appears to play back close to real time (real time 15FPS) but then on export the video was set to 25FPS. Frames could have been added or dropped to do this. Step D observational note: Enhancement/clarity was not a significant change or improvement in image quality from original. No level adjustment (or not enough) was performed to reveal that the video was shot in daylight. Additional notes: Added an audio stream to the video on export.
3BCXA6	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
3D7J7G	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
3TUURJ	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
4AXDXY	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: Step B observational note: File appears to play back close to real time (real time 15FPS) but then on export the video was set to 25FPS. Frames could have been added or dropped to do this. Additional note: Participant added an audio stream to the video on export.
4YG4D2	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
664CE7	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
9373XZ	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: Frame rate was not adjusted.
9BBACZ	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
9F67Z7	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.

TABLE 3

Forensic Video Enhancement Observations

WebCode	Observational Notes
A9U3U4	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps. Additional note: Participant added an audio stream on export.
BD743R	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
D6RY6R	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 16, when real speed was 15.
DMDYHR	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
DRLJ64	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
DZ3VKP	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
EMDGYX	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 12, when real speed was 15.
FBV4CQ	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
FFZL7N	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
FUHC6Q	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
GE6VJV	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 17, when real speed was 15. Step D observational note: Enhancement/clarity was not a significant change or improvement in image quality from original. No level adjustment (or not enough) was performed to reveal that the video was shot in daylight.
GELYAG	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
HEN2JL	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
HKAUTZ	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
JG6L2U	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 16, when real speed was 15.
KWGGWG	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
L93DBK	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.

TABLE 3

Forensic Video Enhancement Observations

WebCode	Observational Notes
L9EK4T	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
LWRMTH	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 16, when real speed was 15.
MBNJ4F	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
MVXGRH	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
NJRFJG	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 29.97, when real speed was 15.
PEG3MP	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
PMAWE8	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
QJBHTM	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: Video plays back close to real time but was saved with a variable rate with a minimum of 8 FPS and a maximum of 24 FPS.
RCZC4A	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 16, when real speed was 15.
RWTNYC	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
T4RKFX	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
TAVG4T	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step E observational note: Video still original size.
TV9WF4	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
U7AYH2	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
URNB3M	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step A observational note: Not trimmed as requested. Step B observational note: FPS in enhanced video was 22.749, when real speed was 15.
V8JJMG	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
VQ83FE	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.

TABLE 3

Forensic Video Enhancement Observations

WebCode	Observational Notes
VV3UNC	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
WCR6BE	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 16, when real speed was 15.
WFRDFN	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 10, when real speed was 15. Step E observational note: Video enlarged greater than 2x.
XBQBKX	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
XR36KA	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step B observational note: FPS in enhanced video was 12, when real speed was 15.
XYWBEB	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
Z3BRL7	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps.
ZQU3LF	Submitted enhanced file(s) were reviewed by an expert who confirmed that this participant completed all requested video enhancement steps with the following exception(s). Step D observational note: Enhancement/clarity was not a significant change or improvement in image quality from the original. No level adjustment (or not enough) was performed to reveal that the video was shot in daylight.

Additional Comments

TABLE 4

WebCode	Additional Comments
2QBFPJ	Overall, I found this test was well designed, and similar to those created by Resolution Video in the past. I only have one thought to share as well as a suggestion that are related to the best practice documents listed on the "Scenario" tab. Thought: Best Practices for Digital Forensic Video Analysis is appropriately listed during this testing cycle, but it is my assumption that OSAC Registry items will be listed in the future. For example, OSAC VITAL's Standard Guide for Forensic Digital Video Examination Workflow is near completion. SWGDE's document is a reference to this upcoming standard. As a laboratory that will adopt registry items soon, we will use OSAC's document once it's listed. Suggestion: This test asks for an opinion that requires content analysis (How many times do you see something being passed from one person to the other during the interaction?). A standard/best practice should be listed for this opinion portion. Currently, SWGDE's Best Practice for Image Content Analysis is the best reference available.
36JKZE	This was a very well thought out test which gave some good challenges. I particularly thought the change play back speed to recreate a more realistic playback was good and has not been asked before in these kinds of test. The only two thing I thought could benefit a change would be 1. a warning when it was about to log you out due to inactivity as several times this caught me out before I had done a save. 2. the last question where you ask how many times something is passed between the persons of interest, it would be good to be able to put wording along with the numerical answer as some of the movement I found could be very subjective as to weather things were being passed or just general arm movement, and would of liked to state that along with my answer. Apart from that I found the whole process of filling out the result straight forward and easy and a interesting challenge to be given.
3BCXA6	Virtual Dub 2 -Add Frame#/Timestamp/Current Time: Timestamp=In, None=Out, Automatic Frame Position, Font Size=200%, Show Frame #=In -Trim from Frame 544 to 1758 -Export: AVI, Uncompressed RGB/YCbCr, RGB24 Axon Investigate -Crop Settings: Width=664, Height=469, x=1256, y=0 -Resize Settings: Width=1328, Height=938, Preset Sizes=X2, Interpolation Method=Bicubic -Levels Adjustment Settings: Range=0 to 59 -Output Settings: Transcode Video=H.264, Compression Quality=Lossless Compression, Frame Rate (Change Speed)=15
3D7J7G	I can produce a report for the processes used.
664CE7	Correct starting frame number for me was 545 and ending frame was 1759 as opposed to 544 to 1758. It is very difficult to see actual items being passed between driver of vehicle and person outside the vehicle. I would never testify to this question as it was very difficult to estimate when items could have been passed between the two individuals. The frames I counted at the beginning, middle and end of the video averaged roughly 16 FPS. I chose 15 FPS for a correction to the video as it was double the reported 7.5 FPS. The video playing at 7.5 FPS appeared slow. At 15 FPS, the actions of vehicles and people seemed normal. The wording in Part 2: Video enhancement Instructions, C, was confusing. The wording, "You can crop closer into the subjects if you want" made me thing that you could zoom in an additional amount. This may have made is somewhat easier to see items being passed between the two individuals, but there was still a good distance between the camera and the vehicle and individuals, making it difficult to see at any zoom or scale level.I opted to stay at 200% and move the image to an area where the time stamp could still be viewed and the road and subject in and around vehicles could be seen.
9373XZ	Question 1-4 does not have a single answer. The way the question is phrased seems to suggest it does. I think the question should be re-phrased to accept a range of answers, or seek the most frequent answer (it is usually 15 frames). Or the video itself should be changed such that the number of frames is truly in sync with the OSD. Question 2-2 is just not a good question. It is imprecise ("something"?) and you are being asked to provide a numeric answer for activity that occurs in a region that is about 85 x 60 pixels (measuring between the driver side doors of both vehicles). By my count there are at least 2 somewhat furtive movements that I did not count as "passes", but might very well have been. Since this is a "forensic

TABLE 4

WebCode	Additional Comments
	video" proficiency test, it seems reasonable that you would treat this exercise as you would something you were prepared to testify in court about, but there is no way I would testify in court that I know with certainty how many times "something" was passed in this video. This makes the question somewhat artificial, in the sense that I am being asked to provide an opinion about something that I would never provide an opinion about as an expert in court (at least, with the level of precision that seems to be expected by the test). I think any enhancement or clarification questions on forensic video proficiency tests should be such that once the test-taker has applied the correct operations to the video, the amount of interpretation required to obtain the desired response should be minimal. That is, the emphasis should be on the enhancement/clarification process (correct diagnosis of problem, correct operations to mitigate, correct order of operations, minimal destructiveness, etc...) rather than the test-taker's ability to interpret video. I will say I do appreciate that the enhancement/clarification question on this exam is not yet another "read-this-license-plate" problem.
9BBACZ	Interesting test, considering the trim editing points did not match the requested timestamp segment in the test. Close, but not the same in the playback with Axon Investigate v.3.2. Elected to go with visual timestamp clip being the more important than specific frames.
DRLJ64	I felt this test was a good representation of a real world scenario.
DZ3VKP	2-2). This question is not part of my laboratory's scope of analysis and was left blank.
FBV4CQ	We also have an internal Forensic Management System (FMS) where my exhibit handling, visual examinations and processing notes are uploaded. I have also had a peer: Admin and Technical Review, which passed. The continuity of evidence is also documented. Including the "child" exhibit which is the resultant media file uploaded to your website. Amped FIVE also creates processing reports which are uploaded to the FMS. Thank you for your time.
FUHC6Q	Question 2-2 requires to count how many times one sees "something being passed from one person to the other". A number was provided, but I feel compelled to mention that, in a strict sense, the video is not clear enough to confirm whether each of the six apparent hand interactions truly involves objects being passed from one individual to another.
HKAUTZ	Video was very dark to begin so brightness applied in order to see date/time stamp.
JG6L2U	Was this tested beforehand with multiple software? On Axon version 3.1.0, the first frame of 4:22:35 PM was on frame 545 and not frame 544. Some software tools start the frame count at 0 and other tools start the frame count at 1. This could potentially explain the difference. I've never had a case where I am asked to start a video presentation at a specific frame. Matter of fact, I like to give a little head room before I start my edit. Also, I certainly would not testify in court stating "something" or "somethings" were exchanged six times in the video. The display area showing the hands are around three or four pixels wide. I can certainly see the arms of both people come close together, I can guess that "something" or "somethings" were potentially exchanged but I can't say for sure. Thank you!
KWGGWG	2-2) This is not part of our laboratory's typical analysis.
LWRMTH	It was noted that the requested frame locations (Start 544 end 1758) did not match the requested time frame by 1 frame, as reported by Axon Investigate software. A decision was made to process the requested times which were equal to start location 545 and end location 1759.
MBNJ4F	Objects may have been passed back and forth at least 6 times. However, the video's resolution and distance of the subjects of interest from the camera does not permit a detailed view to see if objects were in fact transferred from one person to another during these 6 instances.
PEG3MP	When manually counting fps the majority were 15 but some did come in at 16.
QJBHTM	The criteria for 'interaction' is not clear. Although I've marked it as 6 based on what is clearly visible, it could also appear as 7. It would be helpful if you could provide guidelines for what qualifies as interaction, such as what initiates it.
U7AYH2	When I hash verified the .zip folder to confirm the integrity of the download, the results I got were different from those on the test document. My results are as follows using quickhash v3.3.1: MD5: 3741B097A154DCBFC43D00D970557C24 SHA1: FBB259590B70629D58EF9B240587A8E377E5379A I was using Amped FIVE and the cropped video was resized to 1376 x 942 which was enlarged by 2x as

TABLE 4

WebCode	Additional Comments
	requested in Part 2E.
VQ83FE	In answering the object passing question in a real scenario I would likely say that I could only observe objects changing hands twice, but the two subjects' hands appeared to meet six times.
WCR6BE	Referencing question 2-2: I would not make the statement that something is in fact being passed between individuals. I cannot definitely make out an item or the action between the individuals.
WFRDFN	Detail for question 1-4: 04:21:58 - 1 frame. 04:21:59 – 16 frames. 04:22:00 – 15 frames. 04:22:01 – 15 frames. 04:22:02 – 16 frames. 04:22:03 – 15 frames. 04:22:04 – 15 frames. 04:22:05 – 16 frames. 04:22:06 – 15 frames. 04:22:07 – 15 frames. 04:22:08 – 12 frames. 04:22:09 – 16 frames. 04:22:10 – 15 frames. 04:22:11 – 15 frames. 04:22:12 – 16 frames. 04:22:13 – 15 frames. 04:22:14 – 15 frames. 04:22:15 – 16 frames. 04:22:16 – 15 frames. 04:22:17 – 12 frames. 04:22:18 – 16 frames. 04:22:19 – 15 frames. 04:22:20 – 15 frames. 04:22:21 – 16 frames. 04:22:22 – 15 frames. 04:22:23 – 15 frames. 04:22:24 – 16 frames. 04:22:25 – 15 frames. 04:22:26 – 15 frames. 04:22:27 – 13 frames. 04:22:28 – 15 frames. 04:22:29 – 15 frames. 04:22:30 – 16 frames. 04:22:31 – 15 frames. 04:22:32 – 15 frames. 04:22:33 – 16 frames. 04:22:34 – 15 frames. 04:22:35 – 15 frames. 04:22:36 – 13 frames. 04:22:37 – 15 frames. 04:22:38 – 15 frames. 04:22:39 – 16 frames. 04:22:40 – 15 frames. 04:22:41 – 15 frames. 04:22:42 – 16 frames. 04:22:43 – 15 frames. 04:22:44 – 15 frames. 04:22:45 – 12 frames. 04:22:46 – 16 frames. 04:22:47 – 15 frames. 04:22:48 – 15 frames. 04:22:49 – 16 frames. 04:22:50 – 15 frames. 04:22:51 – 15 frames. 04:22:52 – 16 frames. 04:22:53 – 15 frames. 04:22:54 – 15 frames. 04:22:55 – 13 frames. 04:22:56 – 15 frames. 04:22:57 – 15 frames. 04:22:58 – 16 frames. 04:22:59 – 15 frames. 04:23:00 – 15 frames. 04:23:01 – 16 frames. 04:23:02 – 15 frames. 04:23:03 – 15 frames. 04:23:04 – 13 frames. 04:23:05 – 15 frames. 04:23:06 – 15 frames. 04:23:07 – 16 frames. 04:23:08 – 15 frames. 04:23:09 – 15 frames. 04:23:10 – 16 frames. 04:23:11 – 15 frames. 04:23:12 – 15 frames. 04:23:13 – 13 frames. 04:23:14 – 15 frames. 04:23:15 – 15 frames. 04:23:16 – 16 frames. 04:23:17 – 15 frames. 04:23:18 – 15 frames. 04:23:19 – 16 frames. 04:23:20 – 15 frames. 04:23:21 – 15 frames. 04:23:22 – 16 frames. 04:23:23 – 12 frames. 04:23:24 – 15 frames. 04:23:25 – 15 frames. 04:23:26 – 16 frames. 04:23:27 – 15 frames. 04:23:28 – 16 frames. 04:23:29 – 15 frames. 04:23:30 – 15 frames. 04:23:31 – 16 frames. 04:23:32 – 12 frames. 04:23:33 – 15 frames. 04:23:34 – 15 frames. 04:23:35 – 16 frames. 04:23:36 – 15 frames. 04:23:37 – 15 frames. 04:23:38 – 16 frames. 04:23:39 – 15 frames. 04:23:40 – 15 frames. 04:23:41 – 13 frames. 04:23:42 – 15 frames. 04:23:43 – 15 frames. 04:23:44 – 16 frames. 04:23:45 – 15 frames. 04:23:46 – 15 frames. 04:23:47 – 16 frames. 04:23:48 – 15 frames. 04:23:49 – 15 frames. 04:23:50 – 16 frames. 04:23:51 – 12 frames. 04:23:52 – 15 frames. 04:23:53 – 16 frames. 04:23:54 – 15 frames. 04:23:55 – 15 frames. 04:23:56 – 16 frames. 04:23:57 – 15 frames. 04:23:58 – 15 frames. 04:23:59 – 16 frames. 04:24:00 – 12 frames. 04:24:01 – 15 frames. 04:24:02 – 15 frames. 04:24:03 – 16 frames. 04:24:04 – 15 frames. 04:24:05 – 15 frames. 04:24:06 – 16 frames. 04:24:07 – 15 frames. 04:24:08 – 15 frames. 04:24:09 – 16 frames. 04:24:10 – 12 frames. 04:24:11 –15 frames. 04:24:12 – 16 frames. 04:24:13 – 1 frame. This detail was provided due to the lack of clarity of the question. This level of detail is not supported by the portal.
XBQBKX	Video example is typicle of requests received by my unit. However, while I have answered the question re the number of time something is passed from one person to another, this is not evidence I would give. This comment would be the responsibility of the investigator and my evidence would be limited to the technical aspects of the process of signal processing.
XYWBEB	Analysis of the video is done in Amped FIVE software and snapshots were taken for documentation.
ZQU3LF	I used two video editors that both counted the 1st frame of the specified times as different frame numbers than indicated by the CTS Test. Video Focus Pro counted frame #547 as the 1st frame at 04:22:35, instead of #544 and at the end, frame #1761 instead of #1758 as 1st frame at 04.23.56pm.

-End of Report-
(Appendix may follow)

Collaborative Testing Services ~ Forensic Testing Program

Test No. 23-5581: Forensic Video Analysis

DATA MUST BE SUBMITTED BY **Aug. 28, 2023, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234B WebCode: UUBJCX

Scenario:

A vehicle of interest has been seen repeatedly meeting with numerous other vehicles at a spot in a residential neighborhood. Digital video was captured by a nearby homeowner's surveillance system. Enhance and clarify the video and produce a derivative that makes it easier to see and understand the incident.

This test is designed to measure your knowledge and skill in the following digital forensic video processes:
Data verification, Media characterization, Data analysis, and Enhancement.

The skills assessed in this exercise are based on the following best practice documents from the Scientific Working Group for Digital Evidence (swgde.org):
1. Technical Overview of Digital Video Files
2. Best Practices for Digital Forensic Video Analysis
3. Fundamentals of Resizing Imagery and Considerations for Legal Proceedings

Because of the inherent subjectivity of video "enhancement" due to differences in an individual's personal preferences and vision, you will be asked to perform specific tasks including processing the file in a way that is designed to show your understanding of a certain principle or concept. It is critical that you read the instructions carefully and execute all of the tasks.

Evidence:

To verify a complete and accurate download, use the tool of your choice to verify the integrity of the file.
23-5581_VideoMaterial.zip MD5 hash value: 164d346dc1466c57194c641d166b5862
23-5581_VideoMaterial.zip SHA1 hash value: fd32234542e9533cb2f45c71dc1fb2eb06b9c110

Participant Code: U1234B
WebCode: UUBJCX

1-1). What is the SHA1 hash value of the video file?

1-2). What is the container format?

1-3). What is the reported frame rate of the video file (report as a numeric value in fps)?

1-4). Using the on screen timecode display for reference, how many frames are there for each second that passes in the video?

1-5). What is the resolution of the video file?

1-6). Is there an audio track as an element of the video file?

Yes ○ No ○

Participant Code: U1234B
WebCode: UUBJCX

Part 2: Video Enhancement Instructions

Perform the tasks listed below and provide an enhanced derivative video for review.

A. Trim the video so it starts at frame 544 - the first frame of time stamp 04:22:35 PM, and ends at frame 1758 - the first frame of time stamp 04:23:56 PM._x000d_

B. Adjust the frame rate so that it plays back as close to real time as possible.

C. Crop the video in at least to the top right quarter of the frame. You can crop closer into the subjects if you want.

D. Enhance/clarify the video. Use any methods or software tools deemed necessary to improve the viewers ability to see and or understand what is happening in the scene. Note the method or tools used and settings below

E. Enlarge your new cropped video by 2x.

F. Save your enhanced video in .mp4 format with a visually lossless or low constant rate factor (CRF).

Uploaded file name:

2-1). Note methods or tools used and settings for the video enhancement here.

2-2). How many times do you see something being passed from one person to the other during the interaction?

Additional Comments

Please note: *Any additional formatting applied in the free form space below will not transfer to the Summary Report and may cause your information to be illegible. This includes additional spacing and returns that present your responses in lists and tabular formats.*

RELEASE OF DATA TO ACCREDITATION BODIES

The Accreditation Release is accessed by pressing the "Continue to Final Submission" button online and can be completed at any time prior to submission to CTS.

CTS submits external proficiency test data directly to ASCLD/LAB, ANAB, and/or A2LA. Please select one of the following statements to ensure your data is handled appropriately.

○ This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section below must be completed.)

○ This participant's data is **not** intended for submission to ASCLD/LAB, ANAB, and/or A2LA.

Have the laboratory's designated individual complete the following steps
only if your laboratory is accredited in this testing/calibration discipline
by one or more of the following Accreditation Bodies.

Step 1: Provide the applicable Accreditation Certificate Number(s) for your laboratory

ANAB Certificate No.
(Include ASCLD/LAB Certificate here)

A2LA Certificate No.

Step 2: Complete the Laboratory Identifying Information in its entirety

Authorized Contact Person and Title

Laboratory Name

Location (City/State)