



NFSA EOI 2223/P231 – Motion Picture Film Scanners

EOI Document 4 – Technical Specifications

1. Procurement Summary

- 1.1 The National Film and Sound Archive of Australia (NFSA) is seeking Expressions of Interest (EOI) from suitably experienced and capable Suppliers to supply and install multiple motion picture film scanners at the NFSA Building in Acton (Canberra), in order to produce high resolution scans of motion picture films to digital files, in line with industry recognised preservation standards.
- 1.2 For more information, refer to *EOI Document 1 – EOI Purpose and Instructions*.

2. Technical Definitions

Access/Browsing Copy	A digital object that is made for browsing of the digital collection. The Access/Browsing Copy can be made accessible via online systems or distributed to clients prior to them making a final decision on desirability of the material.
Audio channels	Number of audio channel streams stored within a digital file.
Audio configuration	Audio within a digital object is comprised of one or more audio channels. Audio configuration describes how the audio channels are stored and reproduced and is representative of the original source media.
Audio sampling rate	Number of samples of audio per second measured in hertz (Hz) or kilohertz (kHz). 1 kHz = 1000 Hz.
Bit	Short for binary digit. The smallest computational unit symbolised by zeros and ones.
Bit depth (audio)	Digital audio bit depth refers to the resolution of a digital audio file by the number of bits of information per sample. See Bits Per Sample (audio).
Bit depth (image)	<p>Image bit depth refers to the number of bits used per colour channel of an image. Example, 8 bits is comprised of 256 shades of Red, 256 shades of Green and 256 shades of Blue (RGB), producing a total of 16.7 million colours.</p> <p>Higher bit depths reduce banding artefacts in an image that can occur when using a lower bit depth. Higher bit depths provide high colour accuracy of an image during digitisation or scanning, improving colour resolution.</p> <p>Colour accuracy and resolution is determined by the acquisition method. For example, a film telecine bayer chip camera, with a single sensor captures the red, green, and blue colour channels with a chroma subsampling of 4:2:2. At 8 bits, this produces an image with 16.7 million colours with a reduced colour resolution requiring a de-bayer process that interpolates colours.</p> <p>A film linear scan camera capturing at 16 bits, produces an image with 281 trillion colours at a sharper colour resolution due to the scanner having three linear scan sensors each for the red, green, and blue colour channels with a chroma sampling of 4:4:4, resulting in a higher colour resolution as interpolation is not required.</p> <p>Colours per channel (squared):</p> <p>8 bits = 256 (2⁸) colours</p> <p>10 bits = 1024 (2¹⁰) colours</p> <p>12 bits = 4096 (2¹²) colours</p> <p>16 bits = 65,536 (2¹⁶) colours</p>

	<p>24 bits = 16,777,216 (2^{24}) colours</p> <p>32 bits = 4,294,967,296 (2^{32}) colours</p> <p>Total colours (cubed):</p> <p>8 bits = 16,777,216 (256^3)</p> <p>10 bits = 1,073,741,824 (1024^3)</p> <p>12 bits = 68,719,476,736 (4096^3)</p> <p>16 bits = 281,474,976,710,656 ($65,536^3$)</p> <p>24 bits = 4,722,366,482,869,645,213,696 (4.7 sextillion)</p> <p>32 bits = 79,228,162,514,264,337,593,543,950,336 (79 octillion)</p>
Bit rate	The number of bits per unit of time typically measured in seconds. Digital object bit rates are defined by their associated standards organisations. Higher bit rates typically, with exceptions, result in higher quality digital files.
Bit rate mode	<p>Digital object bit rate can be defined as constant or variable.</p> <p>Constant bit rate is a fixed data rate, which informs the compressor or decompressor that the reproduction of a video image regardless of data complexity should remain the same.</p> <p>Variable bit rate is not a fixed data rate. Informs the compressor or decompressor that the reproduction of a video image or audio sample will vary based on computational analysis of the image while maintaining quality within the defined range of the bit rate.</p>
Bits per sample (audio)	<p>Refers to the number of bits used to describe data per sample unit.</p> <p>8 bits = 256 (2^8)</p> <p>10 bits = 1,024 (2^{10})</p> <p>12 bits = 4,096 (2^{12})</p> <p>16 bits = 65,536 (2^{16})</p> <p>24 bits = 16,777,216 (2^{24})</p>
PAL broadcast standard	<p>Globally there are various broadcast television standards for the transmission and reception of terrestrial television signals. Standards are set by the International Telecommunication Union (ITU).</p> <p>Australia adopted the PAL colour system (Phase Alternating Line), standard B (PAL-B) for analogue signals. For digital terrestrial television (DVT), Australia adopted digital video broadcasting – terrestrial (DVB-T) standard.</p>
Channel layout	<p>Audio-visual multitrack recordings can consist of more than one audio channel. Surround sound recordings are a typical example. For example, channel 1 is assigned to the left speaker and channel 2 is assigned to the right speaker. Each channel allocation is derived from the original production recording.</p> <p>The following example is of a 12 channel, multitrack production recording consists of stereo channels with discrete 5.1 surround, encoded 5.1 surround and mono/stereo channels. Reference Rec. ITU-R BS.2102-0.</p> <ol style="list-style-type: none"> 1. Stereo Left (L) 2. Stereo Right (R) 3. 5.1 Left (FL)

	<ol style="list-style-type: none"> 4. 5.1 Right (FR) 5. 5.1 Centre (C) 6. 5.1 Low Frequency Effects (LFE) 7. 5.1 Surround left (Ls) 8. 5.1 Surround right (Rs) 9. Optional encoded 5.1 10. Optional encoded 5.1 11. Other 12. Other <p>Tracks 1 and 2 (Stereo), can be a mix down of the multichannel surround sound.</p> <p>Tracks 11 and 12 could be used for alternative commentary(s), different language tracks or audio description, in mono or stereo.</p>
Chroma subsampling	<p>Chroma subsampling is the practice of encoding images by implementing less resolution for chroma information than for luminance information, taking advantage of the human visual system's lower acuity for colour differences than for luminance.</p> <p>For example, with 4:2:2 the first number refers to the luminance (brightness) part of the signal, and the second two refer to the colour (chroma). In this example, luminance is sampled 4 times while the chroma is sampled twice. Luminance has a higher sample due to the human eye is more sensitive to brightness than colour.</p> <p>Technical representation as follows:</p> <p>4:2:2 – 4=Y(Luma) : 2=R-Y(Red minus Luma) : 2=B-Y(Blue minus Luma).</p> <p>Analogue signals are typically represented as YUV (Y=Luma, UV=Chroma). Digital signals are typically represented as YCbCr (Y=Luma, CbCr=Chroma).</p> <p>4:4:4 chroma signal is not subsampled, providing high colour resolution, and twice the colour resolution of 4:2:2. The luminance sample remains the same.</p>
Codec	<p>Combination of the two words coder and decoder. An input data signal is encoded into a compression format and decoded on output. Codec is commonly referred as compression format, for example JPEG2000.</p>
Coding settings	<p>Codecs contain parameters that can be altered that affect the quality during encoding or decoding of a digital object. Some parameters can affect the quality outcome of a digital object, where others are format dependant and are required to meet standards specification.</p>
Colour space	<p>The colour space is the method of defining the perceptual characteristics of colour information within a digital file. For example, television references colour either as RGB (Red Green Blue), Y R-Y B-Y (Luminance Red minus luminance Blue minus luminance) that is also represented as YCbCr. Print for example references CMYK (Cyan, Magenta, Yellow and Black). Scanned film is RGB while digital cinema is X'Y'Z. The above definitions are ambiguous and overlapping.</p> <p>RGBA RGBA (Red Green Blue Alpha)</p> <p>sRGB sRGB (standard Red Green Blue) created by HP and Microsoft. Specified in IEC 61966-2.1:1999. World standard for digital images.</p>

	<p>sYCC YCC transmits or represents the three Red, Green, and Blue (RGB) channels as a luminance channel (Y) and two colour-difference channels, Cr and Cb.</p> <p>sYCC is simply YCC created from sRGB. YCC is just a shorter way of saying YCrCb.</p> <p>YCbCr Y' luminance, Cb blue difference, Cr red difference. Abbreviated as YCC. Difference, YUV is analogue and YCbCr is digital. Standards describing colour conversion known as transfer characteristics are as follows:</p> <p>ITU-R BT.601 – Standard Definition (SD) standard</p> <p>ITU-R BT.709 – High Definition (HD) standard</p> <p>ITU-R BT.2020 – Ultra High Definition (UHD) standard</p> <p>ITU-R BT.2100 – High Dynamic Range (HDR) Standard</p> <p>YUV Used in PAL composite colour video (excluding PAL-N). One Y' luminance, Two UV chrominance. YUV colour space developed to provide compatibility between colour and black / white analogue television. YPbPr is the component variation sometimes referred to Y'UV. Y'IQ analogue NTSC broadcasting systems. YDbDr analogue SECAM and PAL-N.</p>
<p>Container</p>	<p>A container or wrapper is a method of storing a variety of encoded streams of data or essence with metadata that describe the data within the container.</p>
<p>Compression mode</p>	<p>Encoding of a digital signal can result in a lossy or lossless compression determined by the codec parameters or specification applicable to the digital object.</p> <p>Lossy mode: during the encoding process of a digital signal, information is lost. Audio-visual digital objects can be reproduced that appear to the human eye or ear as a one for one copy, but due to the compression process digital signal information has been lost.</p> <p>Lossless mode: during the encoding process of a digital signal, no information is lost, resulting in a one for one recreation of the data signal. The signal data can be compressed with mathematically lossless algorithms to reduce the size of the resulting digital object.</p>
<p>Digital Object</p>	<p>A digital object is structured data presented as a digital file format for use on computing systems. Digital objects contain technical metadata data to determine which application can read and display the data in a human readable format. Also known as a file format.</p>
<p>Display aspect ratio</p>	<p>Also known as DAR. The ratio of an image or display, width to height.</p>
<p>Display width x height</p>	<p>Display width and height of an image measured in pixel units.</p>
<p>Distribution/Broadcast Copy</p>	<p>The Distribution/Broadcast Copy is an intermediate digital object format created from the Preservation Material or during digitisation, for internal or external use. Typical application of the Distribution/Broadcast Copy includes, but is not limited to, editorial or broadcast transmission.</p>
<p>Edit units</p>	<p>Interlaced video is comprised of two fields per frame of video, often described as odd or even (upper or lower). Edit unit is the interpretation of a single field of video stored within the codec essence of the material exchange format (MXF) container.</p>

	<p>Australian broadcast standard for analogue terrestrial transmission is known as PAL (Phase Alternating Line). PAL standard references the video frame rate as 25 frames per second (FPS).</p> <p>SAMMA JPEG2000 stores each field as a single image, this method does not introduce interlaced or motion artefacts. Considering PAL has a frame rate of 25 frames per second, edit unit would equate to 50 fields per second. Also represented as 50i.</p> <p>SMPTE standard ST422-2014 describes edit units and field-based wrapping within a MXF container.</p>
Essence profile	Essence refers to the coded stream within a wrapper or container, consisting of but not limited to, an audio or video codec. Profile defines a set of capabilities that target applications and inform the decoder as to the requirements to decode the stream. For example, MPEG has many application specific profiles.
Essence wrapping	Essence refers to the coded stream within a wrapper or container, consisting of an audio or video codec. Wrapping is how the essence is stored within a wrapper or container. For example, SAMMA SOLO JPEG2000 is frame wrapped.
Filename extension	A suffix given to digital objects to identify its type in human readable form and inform the computing systems which application to use to open the digital object.
Film gauge	Physical width of the film measured in units of millimetres. Measurement includes the film perforation and soundtrack.
Frame rate	Number of whole frames of an image per unit of measured time, normally in blocks of 1 second, also referred as frames per second (FPS). Australian television for example is 25 FPS. Common film frame rates are 16, 18 and 24 FPS.
Image resolution	Still image horizontal and vertical measurement measured in dots per inch (DPI).
Logarithmic & Linear colour space (Kodak Cineon & Film)	<p>Kodak created a computer based digital film system known as the Cineon System, with the development of the Cineon 10-bit log file format. The Cineon file format has 10 bits, 1024 colours per channel of Red, Green, and Blue (RGB). Colour channels are stored in a logarithmic format that corresponds to the density of the original negative, defined as Log Colour or Log Gamma.</p> <p>Log Colour retains most of the dynamic range of information from the film negative, retaining detail in areas of extreme light and dark (luminance) areas. The resulting film image has the characteristics of a washed-out image also known as a flat image. A flat image is corrected by colour grading or applying a Look Up Table (LUT). LUTs are used to create a 'look' of an image and change from one colour space to another, giving a linear appearance.</p> <p>Linear Colour or Linear Gamma has constant luminance values true to their exact mathematical value.</p> <p>With the discontinuation of the Cineon System, SMPTE developed the file format Digital Picture Exchange (DPX), SMPTE standard; ST 268M:2003, current version.</p>
Lossless compression	Digital object were the data is not compressed or data compression that is reversible, equating to zero loss of quality during encoding or decoding process.
Material Exchange format (MXF)	Material Exchange Format is a container format comprised of video, audio, and ancillary metadata within the one file that is interoperable between various professional audio-visual systems.
Mediaflex definition:	Origin of an item made denotes that the item was made in house at the NFSA, rather than received in an acquisition.

“made”	
Mediaflex definition: “supplied”	Origin of an item supplied denotes that the item was received from an external source through an acquisition, rather than made in-house at the NFSA.
Mime	Multipurpose Internet Mail Extension (MIME) is an internet standard developed to extend the types of data files supported by email. Each standard is allocated a Request for Comment (RFC) number and is governed by the Internet Engineering Task Force (IETF) and the Internet Society (ISOC). Note: There are registered and unregistered types.
Operational pattern	The structure of the Material Exchange Format (MXF) is defined by operational patterns (OP), defining a single essence stream within the MXF container.
Photometric interpretation	Specifies the intended interpretation of the image pixel data. For example, RGB = Red Green Blue.
Pixel aspect ratio	Also known as PAR. The ratio of a pixel in a digital image, width to height.
Preservation Material	Lossless digital objects are made from the physical item or supplied born digital objects. They are kept in the archive, regardless of the compression algorithm they are made with, to be used as the primary preservation files.
Quantisation depth (Audio)	Also known as audio bit depth is the number of bits per sample of audio that corresponds to the resolution of each sample. Bit depth is only referenced in pulse code modulation (PCM) digital signal. Audio formats that are not PCM based and are lossy compression do not have associated bit depths.
Sampling rate	Number of samples of audio per second measured in Hz (hertz) or kHz (1000 Hz).
Scan mode	<p>A digital video image can be comprised of interleaved lines know as fields, interlaced scan, or progressive scan.</p> <p>Interlaced scan: The image is captured and reproduced two different times due to having two fields. The fields are known as odd and even and to capture or reproduce the image, all the odd fields are captured followed by the even fields.</p> <p>Progressive scan: Each line of an image is captured and reproduced in sequence from top to bottom of the image.</p>
Standard reference	<p>Digital objects described in this document are governed by international organisations who define the technical specifications. If a digital object technical specification is not ratified by any of the audio-visual organisations, a reference to appropriate documentation will be provided if available.</p> <p><i>Standard Organisations:</i></p> <p>Audio Engineering Society (AES)</p> <p>European Broadcasting Union (EBU)</p> <p>European Computer Manufacturers Association (ECMA)</p> <p>International Electrotechnical Commission (IEC)</p> <p>International Organisation for Standardisation (ISO)</p> <p>International Telecommunication Union (ITU)</p>

	Society of Motion Picture & Television Engineers (SMPTE)
Timecode	<p>A method that identifies every frame of digital or analogue video media using a time stamp represented as hours, minutes, seconds, and frames.</p> <p>Standards:</p> <p>SMPTE ST 12-1:2014 - Time and Control Code</p> <p>SMPTE ST 12-2 - Transmission of Time Code in the Ancillary Data Space</p> <p>SMPTE ST 266:2002 - Digital Vertical Interval Time Code</p>

3. Technical Metadata

Category: Audio	
Usage: Preservation Material (wav)	
Filename extension	.wav
Mime	audio/wav, audio/wave, audio/x-pn-wav, audio/x-wav (draft), audio/vnd.wave
Proprietary format	Open standard developed by European Broadcast Union (EBU). Broadcast WAV (BWF) is an extension of WAV, developed by Microsoft and IBM.
Developed By	European Broadcast Union (EBU)
Standard Reference	EBU – TECH 3285 (BWF), EBU – TECH 3306 (RF64), IASA TC-05
Audio codec	Linear PCM
Bit Rate mode	Constant
Quantisation depth	<i>Variable – see additional information*</i>
Audio channels	<i>Variable – see additional information*</i>
Audio configuration	<i>Variable – see additional information*</i>
Sampling rate	<i>Variable – see additional information*</i>
Compression mode	Uncompressed
<p>Additional Information:</p> <p>Broadcast Wave Format (BWF) is an extension of the Wave file format developed by Microsoft and IBM. BWF contains the 'Broadcast extension' chunk, coded 'bext' detailing strict metadata requirements.</p> <p>Multi-track media digitised as mono tracks and tar wrapped.</p> <p><i>*The source media determines the number of audio channels, quantisation depth and sampling rate. For example, digital media like minidisc and digital audio tape are digitised with their sample rate and quantisation preserved. For example, Compact Disc (CD), digitised at 44.1 kHz @ 16 bit quantisation. High quality recordings are digitised with a sample rate of 96 kHz @ 24 bit quantisation. Lower quality recordings are digitised with sample rate of 48 kHz @ 24 bit quantisation. Audio configuration is determined by the number of audio channels, configurations are Stereo, Joint Stereo, Dual channel, Single Channel and Multi-Channel.</i></p>	

Category: Film - Moving Image Usage: Preservation Material (jp2 - 8mm and 9.5mm)	
Film gauge	8mm and 9.5mm
Filename extension	.jp2
Mime	image/jp2 (RFC 3745)
Proprietary format	No
Developed By	Joint Photographic Expert Group (JPEG)
Standard Reference	ISO/IEC 15444-1:2016
Image Codec	JPEG 2000 part 1
Display width x height	1280 x 720
Display aspect ratio	16:9
Colour space	sYCC
Colour bit depth	10 bits
Compression mode	Mathematically lossless
Frame rate	<i>Variable – see additional information*</i>
<p>Additional Information:</p> <p>Film is over scanned to include partial perforation area, soundtrack, and frame line.</p> <p>JP2 image sequence wrapped into a Tarball (TAR) including the WAV audio file if available.</p> <p><i>*Match original film frame rate. Audio captured at 25 fps and retimed to match film frame rate, both versions are retained. Image is a sequence.</i></p>	

Category: Film - Sound Usage: Preservation Material (wav - 8mm and 9.5mm)	
Filename extension	.wav
Mime	audio/wav, audio/wave, audio/x-pn-wav, audio/x-wav (draft), audio/vnd.wave
Proprietary format	Open standard developed by European Broadcast Union (EBU). Broadcast WAV (BWF) is an extension of WAV, development from Microsoft and IBM.
Audio codec	Linear PCM
Bit Rate mode	Constant
Bit depth	24 bits
Channels	2 channels
Audio configuration	<i>Variable – see additional information*</i>

Sampling rate	48 kHz
Compression mode	Uncompressed
Standard Reference	EBU – TECH 3285 (BWF)
Developed By	European Broadcast Union (EBU)
<p>Additional Information:</p> <p>Broadcast Wave Format (BWF) is an extension of the Wave file format developed by Microsoft and IBM. BWF contains the 'Broadcast extension' chunk, coded 'bext' detailing metadata requirements.</p> <p><i>*Audio track may consist of Mono, Dual Mono or Stereo soundtracks.</i></p>	

<p>Category: Film - Moving Image Usage: Preservation Material (dpx - 16mm)</p>	
Film gauge	16mm
Filename extension	.dpx
Mime	Image/x-dpx
Proprietary format	Yes
Format	DPX Version 2.0
Width x height	2150 x 1334
Display aspect ratio	16:10
Colour space	RGBA
Bit depth	16 bits
Compression mode	Lossless
Frame rate	Embedded metadata within DPX header: dpx:mp.frame.rate <i>See additional information*</i>
Timecode	Embedded metadata within DPX header: dpx:tv.time.code
Standard reference	SMPTE 268M-2003
Developed By	Society Motion Picture Television Engineers based on Kodak Cineon file format
<p>Additional Information:</p> <p>Over scanned by 5% of a full frame aperture.</p> <p><i>*Frame Rate determined by Scanity TC MODE that specifies how Scanity transforms frame count to timecode.</i></p> <p>DPX sequences are Tarball wrapped before archiving and can include audio files which are recorded separately.</p>	

Category: Film - Sound Usage: Preservation Material (wav - 16mm)	
Filename extension	.wav
Mime	Audio/wav, audio/wave, audio/x-pn-wav, audio/x-wav (draft), audio/vnd.wave
Proprietary format	Open standard developed by European Broadcast Union (EBU). Broadcast WAV (BWF) is an extension of WAV, development from Microsoft and IBM.
Audio codec	Linear PCM
Bit Rate mode	Constant
Bit depth	24 bits
Channels	1 channel
Audio configuration	Mono or Stereo 16mm full coat can be up to 2 tracks
Sampling rate	Optical soundtrack sampled at 48 kHz All full coat magnetic soundtrack sampled at 96 kHz
Compression mode	Uncompressed
Standard Reference	EBU – TECH 3285 (BWF)
Developed By	European Broadcast Union (EBU)
Additional Information: Broadcast Wave Format (BWF) is an extension of the Wave file format developed by Microsoft and IBM. BWF contains the 'Broadcast extension' chunk, coded 'bext' detailing strict metadata requirements.	

Category: Film - Moving Image Usage: Preservation Material (dpx - 35mm)	
Film gauge	35mm
Filename extension	.dpx
Mime	Image/x-dpx
Proprietary format	Yes
Format	DPX Version 2.0
Width x height	<i>Variable - see additional information*</i>
Display aspect ratio	<i>Variable - see additional information*</i>
Colour space	RGBA
Bit depth	16 bits

Compression mode	Lossless																		
Colour Primaries	Linear																		
Frame rate	<i>Match original film frame rate - see additional information*</i> Embedded metadata within DPX header: dpx:mp.frame.rate																		
Timecode	Embedded metadata within DPX header: dpx:tv.time.code																		
Standard reference	SMPTE 268M-2003																		
Developed By	Society Motion Picture Television Engineers based on Kodak Cineon file format																		
<p>Additional Information:</p> <p>Over scanned by 5% of a full frame aperture.</p> <p><i>*Frame Rate determined by Scanity TC MODE that specifies how Scanity transforms frame count to timecode.</i></p> <p>DPX sequences are Tarball wrapped before archiving and can include audio files which are recorded separately.</p> <table border="1"> <thead> <tr> <th>Format</th> <th>Width x Height</th> <th>Perforations</th> </tr> </thead> <tbody> <tr> <td>Techniscope</td> <td>4,300 x 1,660</td> <td>2</td> </tr> <tr> <td>Cinemascope</td> <td>4,300 x 3,324</td> <td>4</td> </tr> <tr> <td>Full Frame</td> <td></td> <td></td> </tr> <tr> <td>Academy Frame</td> <td>4,300 x 3,324</td> <td>Various</td> </tr> <tr> <td>Wide Screen film formats</td> <td></td> <td></td> </tr> </tbody> </table>		Format	Width x Height	Perforations	Techniscope	4,300 x 1,660	2	Cinemascope	4,300 x 3,324	4	Full Frame			Academy Frame	4,300 x 3,324	Various	Wide Screen film formats		
Format	Width x Height	Perforations																	
Techniscope	4,300 x 1,660	2																	
Cinemascope	4,300 x 3,324	4																	
Full Frame																			
Academy Frame	4,300 x 3,324	Various																	
Wide Screen film formats																			

Category: Film - Sound	
Usage: Preservation Material (wav - 35mm)	
Filename extension	.wav
Mime	Audio/wav, audio/wave, audio/x-pn-wav, audio/x-wav (draft), audio/vnd.wave
Proprietary format	Open standard developed by European Broadcast Union (EBU). Broadcast WAV (BWF) is an extension of WAV, development from Microsoft and IBM.
Audio codec	Linear PCM
Bit Rate mode	Constant
Bit depth	24 bits
Channels	<i>Variable - see additional information*</i>
Audio configuration	Mono, Dual Mono, Stereo and Matrixed LCRS full coat can have up to 6 stereo tracks, 3 stereo pairs
Sampling rate	Optical soundtrack sampled at 48 kHz All full coat magnetic soundtrack sampled at 96 kHz

Compression mode	Uncompressed
Standard Reference	EBU – TECH 3285 (BWF)
Developed By	European Broadcast Union (EBU)
<p>Additional Information:</p> <p>Broadcast Wave Format (BWF) is an extension of the Wave file format developed by Microsoft and IBM. BWF contains the 'Broadcast extension' chunk, coded 'bext' detailing strict metadata requirements.</p> <p><i>*Channels – May consist of 1 or more channels</i></p>	

<p>Category: Film File Archiver: Tarball (tar)</p>	
Filename extension	.tar
Mime	Application/x-tar
Proprietary format	No
Standard reference	POSIX.1-2001/pax
Developed by	Bell Labs
<p>Additional notes:</p> <p>Tarball (TAR) format is considered an appropriate file archiver for preservation due to its maturity and is free from limitations compared to other file archive formats. The NFSA utilises uncompressed TAR. For example, the Film Services post scanning process includes semi-automated wrapping of a DPX image sequence, where applicable with a Broadcast WAV Audio file and a file manifest.</p>	