Louisiana Public Broadcasting Digital Preservation Plan

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LPB Digital Preservation Plan

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Chapter 1: Introduction

Section 1.1: Objectives

"Digital preservation combines policies, strategies and actions to ensure the most accurate rendering possible of authenticated content over time, regardless of the challenges of file corruption, media failure and technological change. Digital preservation applies to content that is born digital or converted to digital form."[1]

This document was created as part of the American Archive of Public Broadcasting (AAPB) National Digital Stewardship Residency (NDSR) program. LPB was selected as a host institution for the AAPB NDSR program on the merits of the LPB Digital Preservation Planning Project proposal, as well as in recognition of the station's continuing role in the AAPB (See Chapter 2 for more details). From July of 2016 to February 2017, the station's resident, Eddy Colloton, worked to document LPB's current practices and to identify digital preservation practices which could be incorporated into existing workflows.

The goal of this document is to clearly articulate the policies and responsibilities needed to preserve LPB's archival digital materials by iterating current digital preservation practices and policies and making recommendations for improvement. There are a variety of departments and individuals involved in this process. Similarly, there are a variety of different types of materials in the archive. Due to the broad and varied nature of this topic and the policies described, this document is divided into multiple sections and subsections, with the hope that these components can be used independently as minute and straightforward policy documents.

Policies and workflows are always evolving. Therefore the objective of this document is not to set specific practices and responsibilities in stone, but rather to document new and existing policies with the intent of tracking changes as they occur. This applies to the entire document, but especially application-specific policies, like Section 4.4: MediaInfo as XML, which could change as software updates occur, as well as the multiple Format Migration schedule sections, which should evolve with the ever changing landscape of digital storage solutions. To aid in this process, there are multiple "Evaluation and Updating" subsections throughout this document, which are intended to prompt review and revision of existing practices.

Section 1.2: Scope

This document is intended to establish digital preservation policies and workflows for LPB's archival digital assets. Many of the practices outlined in this document are already performed by LPB staff and have simply not been codified in a policy document. Other policies are new and have either recently been implemented or are in the process of being implemented. These policies should not be seen as fixed.

[1] Definitions of Digital Preservation, ALA, http://www.ala.org/alcts/resources/preserv/2009def

Explicitly stating the current practices involved in the preservation of digital material at LPB is intended to be the first step toward building new practices. In order to facilitate this evolution, communication between departments and individuals is emphasized throughout this document. Recommendations for further policy development are included in each section. These recommendations point toward best practices in the field of digital preservation and are intended to help guide, but not dictate, policy development.

Section 1.3: Challenges and Incentives

The risks posed to the digital material in LPB's Archive center around preservation and contextualization. Preservation of digital material is different from traditional analog preservation because digital video files do not chemically degrade over time. Rather, preservation risks to digital material center on obsolescence and data integrity.

All digital objects depend upon their environment to function. A video file must be viewed through playback software, playback software must depend on a library of video and audio codecs to render the file into an audiovisual stream, and all of this software is dependent upon compatible operating systems. Obsolescence must be rigorously monitored to avoid locking a digital object in an unreadable format.

Data integrity applies to a range of attributes: content, fixity, reference, provenance, and context. The loss of any of these attributes threatens the life of a digital file. Preservation of digital material calls for a well-documented and thoroughly described preservation environment, which ensures that information remains intact at the bit-level, while remaining operable and understandable.

Contextualization of digital material is not dissimilar to the need for contextualization of traditional archival objects. Whether an institution is collecting a 500-year-old vase or a 2016 IMX50 encoded MXF video file, cataloging and collecting information that describes the object is essential to ensuring that it will have meaning in the future. Perhaps unique to digital objects is the lack of meaning they hold without any context. A vaguely named video file on an external hard drive in an office drawer is like a needle in a haystack if one doesn't know what a needle looked like. In this way, the contextualization of a digital object is vital to the preservation of the object. At LPB, this contextualization is facilitated in the archive database through both thorough descriptive cataloging and the collection of production documentation, such as transcripts and copyright statements.

Ensuring a long life for digital material is a complicated and labor intensive process, but by digitizing the analog video in the LPB Archive, and by archiving the born-digital programs that LPB currently produces, LPB protects the station's legacy, preserves the history of modern Louisiana, and provides far wider access to its material than ever before.

Chapter 2:
Background on the LPB Archive

Louisiana Public Broadcasting (LPB) first went on the air in 1975. The station's flagship program *Louisiana: The State We're In* debuted a year later in 1976 and is now the longest running weekly newsmagazine in the state. Through four decades, LPB has firmly established its place in Louisiana culture by producing programs that describe the news, politics, culture and lifestyle in Louisiana from a uniquely local vantage point.

The LPB Archive Project began in 2005 to address the need to organize thirty years' worth of valuable recordings, including interviews with notable Louisianans, unique footage of important places and events, and photographs gathered from all over the world for use in LPB productions. With no centralized archival protocols in place, each producer developed their own systems, which could not be searched by other staff members. By establishing an in-house archive, materials from previous projects could be located and reused in new productions, the management of broadcast rights and permissions could occur between departments, and the station could work towards creating a digital library in order to provide the general public with access to LPB's archived media.

In 2008, the project team brought in Howard Besser and Kara Van Malssen of New York University's Moving Image Archiving and Preservation Program to perform a collection assessment, to evaluate the systems and protocols that had been developed and implemented, and to help in determining the next steps for the project. At this time at LPB, LTO tape machines were being adopted to backup and archive on-air broadcasts, and the station was preparing to move to shooting footage on XDCAM disks. Van Malssen and Besser identified the need for a strategic plan to organize, preserve and provide access to the substantial video collection that LPB had accrued over the course of the station's history. Their recommendations included the need for a station-wide database of assets, a barcode system for tape management, developing criteria for saving content, fostering partnerships with other cultural heritage organizations in the state and exploring paths towards external funding of archival activities. All of these recommendations have been heeded in the subsequent development of the LPB Archive.

After the collection assessment, LPB received four grants in three years related to the Archive. These three grant projects have been important stepping stones in LPB's ability to provide the general public with access to its archival materials through a digital library.
In 2009, LPB received a grant from the Corporation for Public Broadcasting (CPB) as one of twenty-two public television and radio stations to participate in the American Archive Pilot Project (AAPP). The American Archive of Public Broadcasting is a project that aims to preserve and make accessible the assets within public media for the benefit of future generations of the American people.

During Phase 1 of the AAPP, LPB inventoried more than 900 tapes related to the Civil Rights Movement and World War II, the largest output of any station. For Phase 2, LPB digitized and catalogued about 400 tapes over a four-month period, using PBCore, a metadata standard developed by the public broadcasting system for moving images. The AAPP was an important turning point for the LPB Archive. As LPB's first-archive related grant project, the station had the opportunity to preserve a significant cross-section of its archival collection. The project also allowed LPB to hire a fully trained archivist, Leslie Bourgeois, who has remained an integral part of the LPB Archive team.

In 2010, LPB collaborated with Louisiana's Old State Capitol Museum of Political History and the Multimedia Division of the Louisiana State Archives on a 2009 Institute of Museum and Library Services (IMLS) National Leadership Planning Grant to address the need to preserve and catalog Louisiana's film and video resources across multiple cultural heritage institutions and provide access to these recordings through a common online portal called the Louisiana Digital Media Archive (LDMA). Through this planning project, the partners conducted five surveys and four focus groups with six groups of potential end users and content contributors to the LDMA: educators, the general public, producers, libraries, archives and museums. The data from this research demonstrated the interest, need and enthusiasm for a digital media archive comprised of recordings related to Louisiana. The planning project also resulted in the following: best practices guidelines for the LDMA, including the standards being adopted for cataloging, digital file formats, storage and rights management, as well as the project workflow; a database prototype, which incorporates the PBCore metadata standard; and a cost analysis of the available digitization strategies for audiovisual formats.

In 2011, LPB received a grant from CPB for the American Archive Content Inventory Project (AACIP), the next phase of AAPB development. LPB created a workflow that was so efficient and cost effective during the 2009 AAPP, CPB adopted it for the AACIP, including utilizing the same vendor for digitization. In the first phase of this workflow, an inventory record was created for each moving image asset without viewing the media, and instead, relied on the metadata from labels on the tape and its case and any other existing descriptive information. Prior to this inventory, no comprehensive record of these assets existed. For LPB, existing descriptive information was available for some assets through a scheduling database called ProTrack, the station's website, and ancillary materials, like logs and transcripts. During this inventory process, LPB used a naming convention for the identifiers of the assets based on the four or five letter scheduling codes used by PBS and the existing tape numbers, where possible. As a result, LPB completed a comprehensive inventory of its more than 18,000 assets, which consists of both completed programs and raw footage materials. This inventory was LPB's first centralized catalog for its archive collection, an important step in gaining intellectual and physical control of the assets

After the completion of the inventory, the assets were then prioritized for digitization and sent to a vendor for digitization in 2013. When the new digital files were created, they were named according to the identifier of the tape it was digitized from with the addition of the file extension

of the digital file. For example, an mp4 file created from a tape with the identifier LSWI_0902 would have an identifier of LSWI_0902.mp4.

Following the completion of these grant projects, LPB continued working towards the launch of the LDMA from 2012-2014. First, LPB completed the creation of a PBCore-based Microsoft SQL archive database. It contains all of the descriptive and technical metadata fields for PBCore, as well as a section for uploading documentation related to LPB's productions, like scripts and contracts. Next, the LPB Archive team designed the front-end for the LDMA website based on the feedback received during the surveys and focus groups conducted during the 2010 IMLS Grant. A contract programmer then created both the LDMA website and an API between the Archive database and the website.

In 2013, the archivist completed an inventory of LPB's media server, which includes mp4 copies of new productions dating back to 2009. After receiving the digitized assets from the digitization phase of the AACIP in 2013, the archivist also began fully cataloging LPB's digitized assets. In 2014, LPB began an in-house digitization project. The Executive Producer and archivist prioritized content for digitization based on the format of the analog tape and the importance of the content. By the end of 2014, all of LPB's 1" reels were digitized. Since 2015, the transfer engineer has been digitizing the ¾" U-matic tapes.

On January 20, 2015, LPB and the State Archives officially launched the LDMA website, which is located at ladigitalmedia.org. The archivist has continued to catalog LPB's content and make it available to the public on the LDMA. The majority of the content on the LDMA has not been available to the public in several decades.

Needless to say, developing and managing this workflow over the past six years has taken significant time and effort from station employees, whose primary occupation is facilitating and creating local broadcasting programming. Given this situation, policies, procedures, and responsibilities have developed as a matter of course, and were not fully documented. In 2015, LPB applied for the AAPB National Digital Stewardship Residency (NDSR) grant, which would fund and facilitate a recent graduate from a master's degree program to come to LPB to review the station's current digital preservation policies and to make recommendations for future improvement. As mentioned previously in this document, LPB was selected as a host institution for the AAPB NDSR program on the merits of the LPB Digital Preservation Planning Project proposal. This document is a result of the LPB NDSR residency and hopes to document LPB's current digital preservation practices and identify a path towards improving the workflow.

Chapter 3: Collection-Wide Policies

Section 3.1: Collection Development Policy - Selection Criteria

Specifically outlining and defining which materials will enter the LPB Archive is essential. Any number of preservation actions - from quality control to description - are expedited by consistency and uniformity in the collection. Moreover, not all material can be preserved, nor should all material be preserved. To avoid overwhelming the capacity of LPB's archive, an **organization-wide understanding of how completed materials should be deposited to the archive** must be achieved. Given that the rights status, re-use value, and production workflow of different types of locally produced programs varies significantly, so too should the submission policies for those programs. The ways in which Legacy Programs, Born-Digital Programs, and Documentaries should be delivered to the archive are defined separately.

A commonality among all of these criteria is a need for material to simply make its way to the archive in **a uniform fashion**. All local productions develop material that aids description and reuse of the program's content, such as scripts, supers lists, and credits, out of necessity. Yet, these materials do not always reach the archive, or only reach the archive after an employee retires. This document, and the following policies, aims to put forward methodologies for submitting these materials regularly, in a manner that does not add undue burden on the production process. The aim of these policies is to collect material that is already being produced by LPB in a simple and expedient manner.

The selection criteria put forward in this document is intended to begin the conversation about what LPB should collect, and how LPB should require submission of materials to the archive. As these policies are implemented, they should be expanded upon and refined in order to best suit the needs of production and the archive. The long-term goal of this archival submission policy is to fit seamlessly into the production workflow, without adding significant time or responsibilities to the engineers, editors, producers, photographers, and administrators whose primary role is creating original programming.

Recommendations
The ability to re-purpose and provide access to the audiovisual material that LPB preserves is dependent on the ability to accurately identify rights restrictions now and in the future. To this end, any talent releases and contracts that impact the rights of a particular program in the LPB Archive should be included in the selection criteria. Contracts for LPB produced programs are currently reviewed and distributed by multiple departments, and deposit of a digital copy should be included in this practice. The digital copy can then be uploaded to the archive database, where a wealth of documentation for LPB programs is stored. LPB's archivist has been working to collect such documentation on legacy programs, but the dispersed nature of these records makes this process time consuming. Future productions should make an effort to streamline this process.

Similarly, scripts, transcripts and credits lists should be uniformly submitted to the LPB Archive. Efforts to motivate producers to promptly submit such documentation have been ongoing, but with mixed results. These efforts and the need for such documentation are articulated further in the Born Digital Programs section. Formal and regular prompting of producers to submit documentation could aid in this effort. One of LPB's several regularly held meetings, such as the weekly production meeting or the department head meeting, could offer an opportunity to do so.

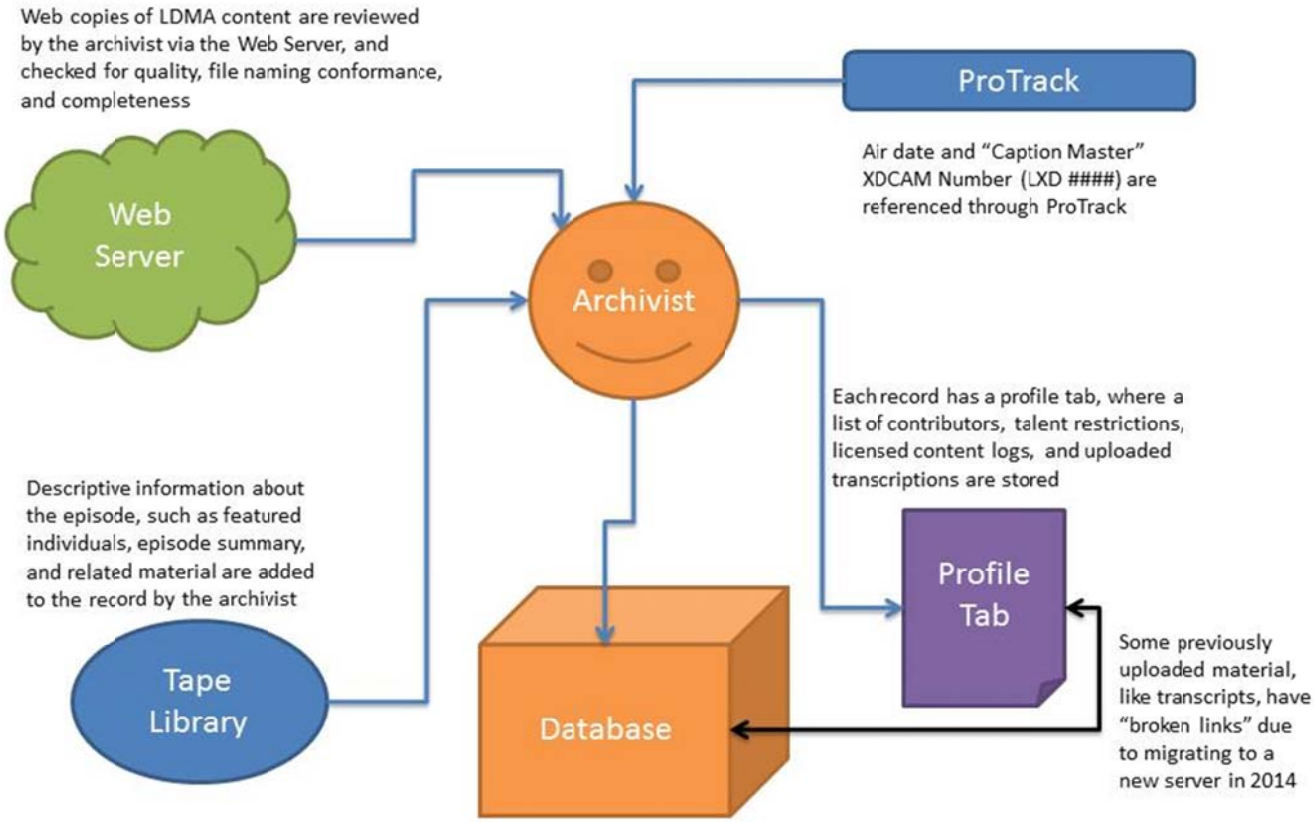
Section 3.2: LPB's LDMA Content Policy

Prior to the launch of the LDMA in 2015, the LPB Archive team developed a content policy outlining the LPB material that will be made available to the public. It also includes information on how the material will be presented. This policy is updated as needed.

1. Episodes from series that LETA holds the rights to will be posted to the LDMA in their entirety.
    a. For newsmagazines that contain multiple stories per episode, like *Louisiana: The State We're In*, each segment will be posted individually.
    b. For individual episodes of a series that cover only one topic, like *Louisiana Public Square* or *A Taste of Louisiana with Chef John Folse and Company*, the episode will be posted in its entirety as one record.
    c. For *Art Rocks!*, only the two local segments will be posted to the LDMA. No national content will be posted. If a local segment was previously broadcast on another show, like *Louisiana: The State We're In* or *Louisiana Artists: Profiles on Canvas*, the original segment will also be included in the *Art Rocks!* series page.
2. For LPB's current productions, the current season and previous season will be posted to www.lpb.org. All previous seasons will be made available on the LDMA.
3. No repeated or re-broadcast content will be made available on the LDMA. Content will only be posted with its original show. For example, the re-airing of the *Louisiana Public Square* backgrounder on *Louisiana: The State We're In* will not be posted as an individual segment.
4. No full-length documentaries will be permanently posted to the LDMA. One to three documentaries that relate to the LDMA monthly highlighted topic will be posted for the entire month.
5. No raw footage interviews will be made available on the LDMA.
6. Videos posted as full-length episodes or programs will be cued to start after the underwriting message and show opening. They will be cued to stop after the closing credits, underwriting messages, and copyright statement. Videos posted as segments will be cued according to the in and out points of the individual segment.

Section 3.3: Cataloging Process

The cataloging process at LPB is the point in the workflow where the majority of descriptive metadata is recorded. The image below is intended to demonstrate how the archivist collects information from various sources, including the web encoded access copy video file, in order to provide thorough descriptions of the content within LPB's collection. These descriptions are written with keyword search in mind, specifically naming all people and places of interest in a particular program, as well as the subject matter discussed. These descriptions also feature contextual information, such as the airdate of the program or a featured politician's term of office, which also helps facilitate a keyword search of the publicly facing website or the internal database.



Section 3.4: Access to the LPB Archive

The media that LPB preserves is made available to the public for free on the aforementioned Louisiana Digital Media Archive website, located at ladigitalmedia.org. Material hosted on the LDMA website has been vetted to ensure that LPB holds sufficient rights to make the program available online, and that the program complies with the LDMA Content Policy. The LDMA website allows the user to search the entire collection by keyword or to browse the contents of the website by series or topic, such as "Civil Rights," "Energy," or "Environment." LPB maintains

this website as an access portal to digitized Legacy Programs, as well as content owned and digitized by the Louisiana State Archives.

Archived programs produced by LPB can also be found on the American Archive of Public Broadcasting website, americanarchive.org, which has recently been updated to include more of LPB's content. The AAPB website holds the records, and where available, streaming audio and video, from all of the participating public broadcasting stations in the AAPB. Similar to the LDMA website, the AAPB website allows users to search for content by keyword or browse by topic, enabling the public to view the archives of multiple public media stations, and gain a macro perspective of the public broadcasting landscape at a given time or on a given topic.

Finally, LPB's archival content makes regular appearances over the air in LPB's current programs. Producers of *Louisiana: the State We're In* and *Art Rocks!* regularly make use of material from the LPB Archive.

Section 3.5: LDMA Usability Recommendations

The focus groups performed as part of the IMLS-funded LDMA Planning Project provided valuable insight from stakeholders in the LDMA website. Needs identified by educators revolved around a lack of time to explore the LDMA resource, and a need to be able to find material quickly and easily. In particular, educators noted the need to be able to browse by date, by people of interest, and grade level. The fields and keywords necessary to sort by this information currently exist in the archive database, which powers the LDMA website. It is simply a matter of matching the appropriate SQL query to HTML functions. These needs, as well as other internal needs for the archive database, such as adding additional fields, can be met by contracting a programmer to perform these specific tasks.

However, the key need expressed by educators was not technical or programmatic. Many educators requested lesson plans that are based on material available through the LDMA. It is recommended that LPB consider creating lesson plans based on LDMA content through collaboration with an educator or student studying education. An LSU student worker or intern could gain valuable experience by creating lesson plans using this material.

LPB should engage with the users of the LDMA to gain a better understanding of how the resource is currently being used. Google Analytics is used on a regular basis, but this service only details the user's location, not their engagement. It is important to determine if the LDMA website is meeting the needs of its users. To this end, it is recommended that the LDMA website offer an optional survey. The survey should ask current users: if they found what they were looking for; what material they were looking for (perhaps by subject or topic); and their opinion on how the resource could be improved.

Section 3.6: Preservation of Database Assets

The organization and description of the tape library's holdings is dependent on a Microsoft SQL database, library.lpb.org, maintained by the archivist and the Web IT manager. Without the information that has been meticulously entered into the database, and the content that has been uploaded to it, the LPB Archive and the LDMA website could not operate.

The Web IT department ensures that a native Microsoft SQL database backup, "LPBCore.bak," is performed twice a month (on the 1st and the 15th). This backup is stored on a "cloud" based service (Google Drive) for faster retrieval. It is the only offsite backup of the database. Additionally, the Library server is backed up to a 10 terabyte network attached storage (NAS) device once a week, with incremental backups made daily. The weekly backup to the NAS is also copied out to LTO data tape. The Engineering IT department stores three LTO tape backups on the library server, regularly overwriting previous backups. These backups are automated and monitored through the software Symantec Backup. In the event of a hardware failure, the Library server could be restored through a virtualized environment, or Virtual Machine (VM), from LTO data tape, within four hours.

To ensure that material that is uploaded to the database is not corrupted or susceptible to so-called "bit rot" (data loss due to the gradual decay of storage media) fixity checks should be performed regularly. To automate this process it is recommended that LPB use the *Fixity* application, developed by Audiovisual Preservation Solutions.

Fixity Application Set-up

The *Fixity* application allows the user to schedule checksum generation and validation on a daily, weekly, or monthly basis. To conserve energy and avoid needless wear on storage devices, **LPB should run these checks once a month.** Once every 6 months would likely suffice, but is not possible through the software at this time. Using the application's interface, schedule the program to run in between backups, such as the 7th or the 22nd of every month.

There are many checksum algorithms available to choose from, the most popular of which are md5, sha-1, or sha-256. These different algorithms vary in their complexity, but are all widely adopted and implemented, so none would present a preservation risk in terms of obsolescence. **It is recommended that LPB use md5 checksums**. The advantage to using the md5 algorithm is the low amount of processing power needed to generate the sum. The disadvantage is that the sum is not as complex (it contains fewer characters) and therefore not as unique, but the amount of data LPB would be verifying doesn't justify that concern. The checksum algorithm can be adjusted in the preferences menu in the application.

It is important to maintain the *Fixity* application's native directory structure. Checksums generated by the application are stored as a .tsv file in the "history" directory. Similarly, other information such as reports and schedules are automatically placed in corresponding directories. These processes will fail if the directory structure is altered.

In addition to storing reports in this directory structure, *Fixity* reports the results of the automated processes via email. In order to configure the email reports, go to “Email Settings” in the preferences drop down menu. You will need the SMTP server address and Port number, along with the password.

The reports emailed to the user after the automated processes are completed contain the following information: the date of the report, the total files checked, and the number of files that were new, changed, moved/renamed, or removed. The file name and full file path of each file will accompany each email as an attachment in .tsv format. This .tsv file will also be automatically saved to the *Fixity* folder, in the “reports” directory.

To indicate which directory or directories the application should scan, simply enter them into the “Directories” column using the “...” button to browse. Indicate which email address the reports should be sent in the corresponding column to the right.

For more information on *Fixity* and to see a tutorial video visit:
https://www.avpreserve.com/tools/fixity/

Fixity application Preservation Actions and Procedure:
The archivist will receive a summary email once a month listing all of the files uploaded to the database. Those files will be divided into five categories:

1. Confirmed files (unchanged files)
2. Moved or Renamed files
3. New files
4. Changed files
5. Removed files

The archivist should first take note of the number of total files and new files, as well as the “Time Elapsed” (all listed in the email report). The first time Fixity was run on the Library Server assets it took less than one minute. A significant increase in the “Time Elapsed,” especially without a corresponding increase in the number of new files, could be a sign that the process is encountering errors, or that the Library Server’s hardware is failing.

As the archivist is likely the only LPB staff member who will be uploading content to the database, keep an eye out for anything unusual. If the archivist has not removed files from the database, obviously there should not be any “Removed Files” listed in the report.

The archivist’s primary concern will be encountering “Changed Files.” As the documents that are uploaded to the database are not designed to be edited (in the way that a shared word document would be, for instance) **any change in the file is likely a sign of corruption**.

What to do when a "Changed File" is reported (note that steps 2.1 and 4.1 are diagnostic, and can be phased out as clear patterns in Fixity's reporting emerge):

1. Identify which file(s) has/have changed. Open the .tsv file attached to the email using Excel. Use the "Find" function to locate files with "Changed" in the left column.
2. Determine if the file is in fact flawed. Locate the changed files through the database. Attempt to download the file. If the file cannot be downloaded, it is likely corrupted.
    a. If the file can be successfully downloaded and viewed, consider the possibility of the file having been changed. Is it possible someone at LPB edited the document? If it is not immediately apparent that the file was intentionally edited, keep the downloaded file, and proceed to step 3.
3. Locate a previous version of the file in question. A copy stored locally on the archivist's computer or on the production shared drive are ideal locations. If the archivist does not have access to a previous version of the file, contact the IT staff and request that the file be restored from a backup of the database assets.
4. Replace the "Changed File" with a previous version by uploading it to the database.
    a. If the file that was reported "Changed" could be downloaded from the database, compare the two files' checksums to confirm that they are the same. If they are the same, then the issue is with the *Fixity* software's verification process and not with the file. If the checksums are different, then the *Fixity* application correctly reported a change. If the content of the file has not changed, but the checksums do not match, then the file was likely corrupted in a way that did not prohibit it from being opened. Upload the restored file and delete the changed version.

Digital Preservation Policies by “Program Type”

The following three sections of this document outline three distinct types of materials that the LPB Archive is entrusted to preserve and make accessible. Each of these three types of materials is created under unique circumstances, and therefore requires different approaches to be appropriately archived. These three categories of LPB productions are:

Legacy Programs, which are defined as content produced before the current LPB Archive initiative was put in place. This category has been defined with analog video materials in mind, but born-digital media, primarily stored on tape-based formats, also fall into this category.

Born-Digital Programs, which in this document is used to describe the weekly and monthly programs LPB produces on a regular basis. This includes, but is not limited to, *Louisiana: The State We’re In*, *Art Rocks!*, and *Louisiana Public Square*.

Documentaries are often accompanied by a wealth of materials with high reuse value. Moreover, the varying types of agreements and contracts involved in the production of these programs means that the rights status is less clear without thorough documentation. Collection of materials related to this content also reduces duplicated efforts, as these programs are often re-aired, and therefore will require promotion and description.

Chapter 4: Legacy Programs

Section 4.1: Project/Purpose Statement

Since going on the air in 1975, LPB has been present and a part of some of Louisiana and the nation's most influential historical moments. As a local and publically funded television station, LPB has documented American culture from a unique vantage point. Locally produced media allows communities to define themselves through increased opportunity for self-representation. Content created for a community by those from that community captures culture from a privileged vantage point. From crawfish boils to state elections, from political demonstrations to local art fairs, public broadcasting stations help define American culture from the bottom up instead of the top down. Keeping a record of locally produced content is invaluable to accurately understanding and portraying history. Moreover, as current events echo or contrast with this history, having primary source documentation becomes a powerful asset when contextualizing and reporting on these events. To this end, LPB has pledged to preserve and make accessible the historic Louisiana video contained within the station's archive for the benefit of future generations. As mentioned previously in this document, this material is made available for free online through the Louisiana Digital Media Archive at ladigitalmedia.org, through the American Archive of Public Broadcasting, and through LPB's contemporary broadcasts, which often feature excerpts of archival material.

As a television station with a strong web presence, LPB is well situated to take on the complex process of preserving analog video and making it accessible through digitization and online access. LPB staff's expertise and understanding of analog video and the maintenance of analog video playback equipment is a significant asset in this process, as is the web infrastructure designed and maintained by LPB's Web department. Coordinating the many moving parts of this complex workflow is difficult and requires the collaboration of many different departments and individuals, all with specialized expertise. To that end, the following chapter of this document hopes to document the current practices of LPB's efforts to digitize the analog video in LPB's archive.

The fields of cultural heritage and audiovisual preservation have, especially in the last decade, begun focusing intently on the preservation of digital and audiovisual media. This trend has yielded a strong corpus of documented workflows and best practices, which utilize sophisticated tools for metadata extraction, verifying data integrity, and automation. The recommendations from the following section draw on the best practices and standards in this field to help improve LPB's current practices.

Section 4.2: Preservation and Quality Control

Preservation actions on material from the LPB Archive are prioritized first by format, and then by content. Formats that have been determined to be most at risk have been prioritized over more stable formats. For example, LPB has already digitized all of the 1" open reel video from its

collection. Organizing the digitization “queue” by format offers many advantages from a technical standpoint and from a preservation standpoint, as the same equipment can be used throughout the process and issues encountered during the digitization process will likely be similar. Digitization then occurs by program. For instance, all of the ¾” U-matic broadcast masters of *Louisiana: The State We’re In* were digitized consecutively.

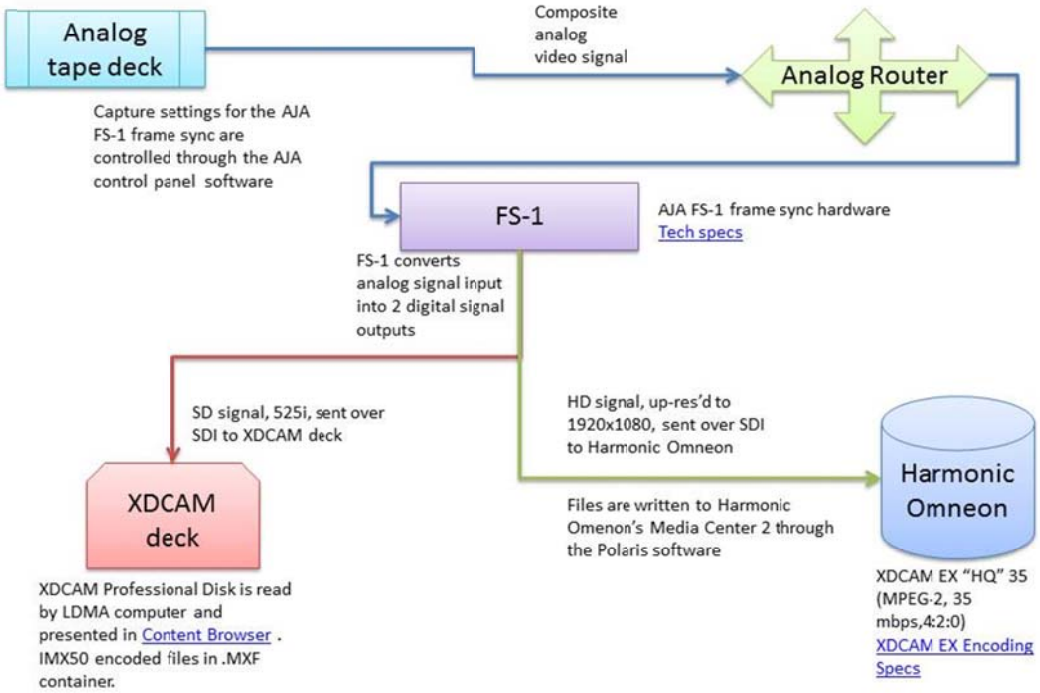
Playback of at-risk material, such as U-matic videotapes (a.k.a ¾” tapes), should be limited, as this action can introduce wear and tear on the tapes, as well as the playback decks necessary for preservation of the content stored on these formats. The friction and high playback speed of tape (3.75 inches per second for the U-matic format) as it is read by the magnetic head in the Video Tape Recorder (VTR) can cause older or degrading tapes to “flake” and breakdown, representing a loss of information. This loss of information is most commonly seen through “dropout,” or black horizontal lines in the picture area of the video signal. The more often the tape is played, the higher the risk of flaking and information loss.

The current digitization process, shown below, makes use of the existing production infrastructure by re-purposing the AJA FS-1 Frame Sync, Harmonic Omneon Playout Server, video encoding automation scripts, and the Sony XDCAM encoders. Repurposing this software and hardware utilizes existing workflows and adds value to existing institutional knowledge. For instance, engineers do not need to learn new software interfaces. Also, technical workflows, like commonly used signal paths, require less troubleshooting. That being said, this infrastructure does introduce complexity and compromises into the workflow. Pragmatically, a balance must be struck between the benefits of well-worn and widely understood processes and best practices in the field of archiving and preservation.

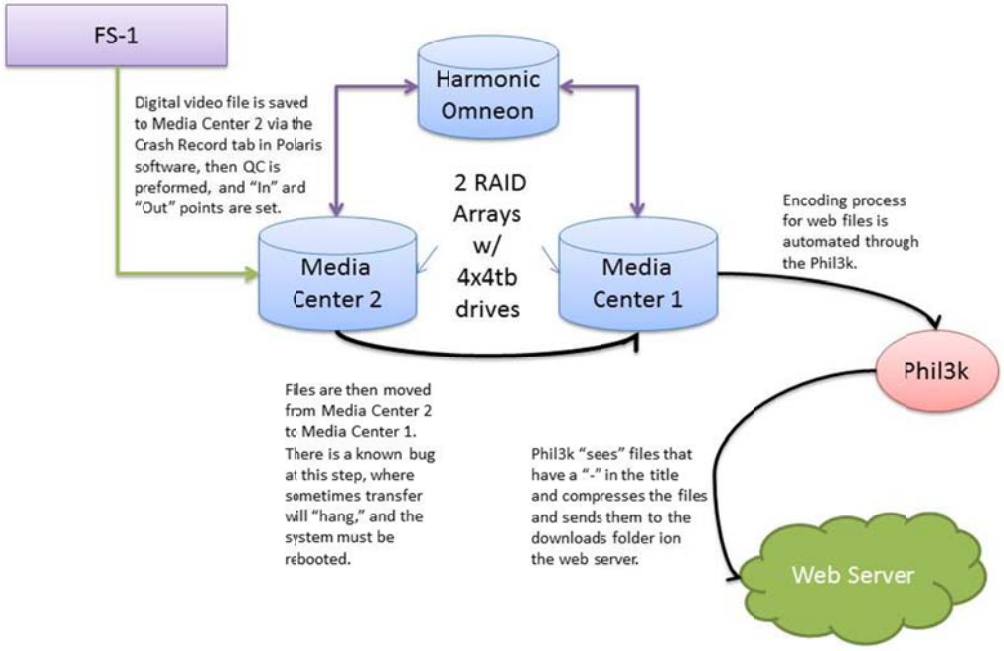
This process results in the creation of two files. One high resolution master file is created for preservation and stored on two identical LTO tapes. The other low resolution file is created for online access and stored on a web server, which is linked to the LDMA website. Here are the technical specifications:

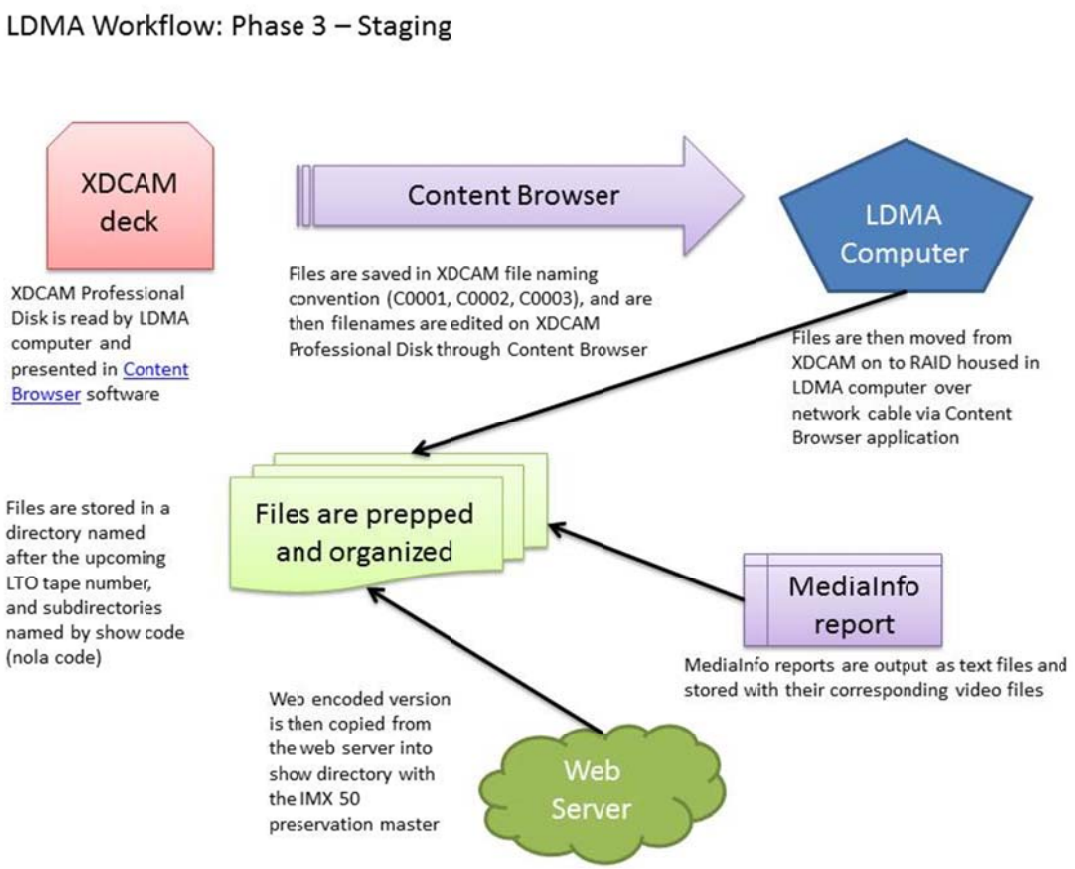
- **Preservation Master File:**
  Container: MXF
  Video codec: IMX 50
  Audio codec: PCM, 16 bit, 48 kHz
  Chroma subsampling: 4:2:2
  Frame size: 720x512
- **Access File:**
  Container: MP4
  Video codec: h264
  Audio codec: aac, 48 kHz, 128
  Chroma subsampling: 4:2:0
  Frame size: 640x480

LDMA Workflow: Phase 1 – Digitization



LDMA Workflow: Phase 2 – Web Encoding





The current process for creating digital files of previously analog material for the purposes of preserving that material, have recently been discussed, and will be revised as a part of the National Digital Stewardship Residency project.

Recommendation (1 of 2):
Capture all Content on Tape!
As this is a preservation project, any information on the tape should be considered valuable, be it bars and tone, titles, or slates. Any form of source head information from the analog tape should be included on the resulting digital video file. The LDMA website will jump to the content through In and Out points set in the database, so there's no need to trim.

Recommendation (2 of 2):
Capture Preservation Masters as Uncompressed or Lossless Files
When migrating analog material to digital formats, using non-proprietary and uncompressed, or lossless, video and audio codecs and file containers as a preservation format is considered best practice. The XDCAM encoder limits the options that LPB has in terms of digital video encoding, and prevents the institution from capturing video in uncompressed or lossless formats.

The encoder also creates a non-standard frame size, 720x512. This is not an overt preservation risk, necessarily, but adherence to standards and conformity with widely adopted file formats

offers additional protection to preservation masters. The current preservation format, IMX50 encoded MXF files with a 720x512 resolution does not conform to those standards and, therefore, does not reap the benefits of that protection.

The XDCAM encoder also presents a risk in that the original copy of the file is written to temporary storage media. The necessary transfer of the file from the XDCAM disk to the RAID represents a risk of file corruption. This transfer also presents a risk of human-error. Files have been lost in the past because they have not been moved off of an XDCAM disk before that disk was erased and written over.

Moreover, encoding a file directly to an XDCAM disk makes it more difficult to perform fixity checks and automated quality checks on the digital video file in its original form. Generating a checksum of a copy of a video file compromises the provenance and chain of custody information usually associated with a checksum.

The AJA FS-1 Frame Sync also presents a risk to the successful migration of analog material to digital formats for preservation. The FS-1 is currently used to stabilize the analog signal, and to route the signal to multiple locations. The FS-1 converts the analog video signal it receives into two signals: a standard definition SDI signal and a high definition SDI signal. The standard definition signal is then sent to the XDCAM encoder, while the high definition signal is sent to the Harmonic Omneon. The XDCAM encoder is programmed to create a standard definition video file, so regardless of whether it receives the intended standard definition signal, or inadvertently receives an “up-res’d” signal, the final version of the file will be encoded in the same way. Identifying and preventing this mistake would be very difficult. In this way, the FS-1 complicates the creation of digital video files from analog material.

These risks can be averted by simplifying the digitization workflow and excluding multi-purpose equipment and processes. By replacing the XDCAM encoder with an Analog-to-Digital converter and writing newly digitized video files directly to the LDMA RAID, LPB can at once reduce the risk of file corruption and more easily create standardized preservation masters that are in keeping with archival best practices.

Here are example file types that would be in keeping with audiovisual preservation best practices for preservation master formats:

Container: MXF Video codec: Uncompressed Audio codec: PCM, 16 bit, 48 kHz Chroma subsampling: 4:2:2 Frame size: 720x486	Container: MOV Video codec: FFV1 Audio codec: PCM, 16 bit, 48 kHz Chroma subsampling: 4:2:2 Frame size: 720x486	Container: MXF Video codec: JPEG2000 Audio codec: PCM, 16 bit, 48 kHz Chroma subsampling: 4:2:2 Frame size: 720x486	Container: MKV Video codec: FFV1 Audio codec: PCM, 16 bit, 48 kHz Chroma subsampling: 4:2:2 Frame size: 720x486

A note on recommended formats: The MXF container and the MKV container are recommended here because they are both non-proprietary formats. The broadcast community is involved in the standardization of MXF and, therefore, it may be appealing to LPB to adopt this format. On the other hand, the MKV format is standardized by the IETF (Internet Engineering Task Force) and is broadly adopted in the open source community. It is also gaining popularity in the field of preservation. Essentially, the choice here is between regularly scheduled updates and standardization by the broadcast industry (MXF) or continual community driven updates and standardization by a broader user-base (MKV). A similar dichotomy exists between FFV1 and JPEG2000. Both are widely adopted lossless codecs, with JPEG2000 being used more regularly in the broadcast community and the entertainment industry, and FFV1 being used by Internet communities and companies, such as YouTube or Europeana. Uncompressed video encoding would be the "safest" choice of these three, as it is not dependent on changing values of any user-community. The downside to uncompressed video files is that they require more space than lossless video files.

Here is a file size comparison between the proposed formats:

- uncompressed (e.g., v210) 10-bit -> approx. 100GB per hour of video;
- lossless compression (FFV1 and JPEG 2000) 10-bit -> approx. 45-50 GB per hour of video;
- lossy compression;
    - MPEG 2 (50 Mbps) -> approx. 25 GB per hour of video;
    - DV (DV25) -> approx. 12 GB per hour of video;
    - MPEG 2 (DVD quality) -> approx. 3.6 GB per hour of video.[2]

Lossless file formats are growing in adoption, but in many cases of commercial use, where preservation is not a concern, lossy compression is deemed acceptable. Indeed, the average viewer cannot visually perceive a significant difference between a lossy encoded video file and a lossless encoded video file. That being said, information is certainly lost when encoding to a lossy format. For example, compressing information encoded into an analog video signal can destroy analog "line 21" captions.

Due to the relative scarcity of need for lossless encoding, most analog-to-digital converters and accompanying software do not support capturing an analog signal directly to a lossless encoding. In order to surmount this hurdle, moving image archives capture analog video as an uncompressed digital video file and then transcode the file to a lossless format. The lossless copy can be checked against the uncompressed copy to ensure that no information has been lost in the transcoding process using the FFmpeg video encoding software. The software allows the user to create a checksum for each frame of video. This function is referred to as "frame md5." At the time of this writing, LPB is using FFmpeg version 20160819-2a3720b. When creating a frame md5 output for a lossless file, FFmpeg essentially "plays back" the lossless file and creates a checksum for each frame in the video. When this is compared to the frame md5

[2] Lorrain, Emanuel. A short guide to choosing a digital format for video archiving masters, March 2014.
https://www.scart.be/?q=en/content/short-guide-choosing-digital-format-video-archiving-masters

output of an uncompressed file, it should be identical, guaranteeing a mathematically lossless conversion. The comparison of frame md5 outputs is not unlike the comparison of checksum manifests described in Section 4.6. Examples of moving image archives using this workflow can currently be found on the Irish Film Archive's github account, in the "makeffv1.py" python script (https://github.com/kieranjol/IFIscripts/blob/master/makeffv1.py) and on the CUNY TV media microservice's github account, in the "makelossless" bash script (https://github.com/mediamicroservices/mm/blob/master/makelossless).

Interoperability and compatibility with existing systems will likely be the determining factor in selecting a preservation format for LPB. For example, in LPB's current workflow, a preservation master file format should be compatible with the Avid Media Composer software and Avid Media Access (AMA) so that editors can quickly and easily import video files from the archive into a program they are editing. Avid can decode both FFV1 encoded video files and should be able to decode and encode JPEG2000 files. Avid also supports both the .mov or Quicktime file container and the MXF file container. However, a series of lossless video files were created for testing using FFmpeg from an uncompressed video file provided by Wisconsin Public Television, and LPB Engineering Section Manager Chris Miranda found that only the FFV1 encoded .mov file could be imported through Avid on Miranda's workstation. To complicate matters further, the Avid Media Composer software installed on the computers in the edit bays, Avid Media Composer version 8.0, does not allow importing the same FFV1 .mov file. This is most likely a result of Miranda using a more recent version of Avid on his machine, Avid Media Composer 8.3.

Given that Avid states that their software supports JPEG2000 MXF files, more testing could be performed to determine why the JPEG2000 MXF file could not be imported through AMA. It could be that AMA does not support this file format, but Media Composer does, or that the JPEG2000 library that either FFmpeg or AMA is using is depreciated. In any event, the FFV1 encoded .mov video file is an ideal preservation master file format and in line with audiovisual preservation best practices.

It is recommended that LPB begin to migrate analog video to digital formats by: using an Analog-to-Digital converter (as opposed to the XDCAM encoder); **capturing video as an uncompressed video file**; transcoding the uncompressed video file to a FFV1 encoded .mov file; and **verifying that the transcode was mathematically lossless** using the FFmpeg frame md5 function before deleting the uncompressed file.

Using a simplified signal path and relying on an Analog-to-Digital converter will reduce the risk of errors and bring the digitization process more in line with audiovisual best practices, but it will also reduce the extent to which the workflow can take advantage of existing processes. The recommended new workflow will not be able to take advantage of the existing process for encoding web files. **The access copy, or web encoded file, created for the LDMA website will need to be created differently**. An MPEG-4 video file can be created through an automated process, similar to the way the FFV1 encoded copy will be made. If encoded at a high enough quality, this MPEG-4 video file could be used in new productions, reducing

dependency on the FFV1 preservation master file format's interoperability with the Avid software. To facilitate this dual purpose, the specifications and sample rate of the MPEG-4 video file should be created with the minimum viable broadcast specifications in mind. For example, the playout server currently uses a 35 mbps sample rate.

After the MPEG-4 video file has been created through an automated process, it will be staged to be written to LTO tape with the preservation master, and also copied to a network drive, where Web IT and the Archivist will have access to the file. This file could either be copied once more to the web server, creating a redundancy and backup copy of the file, or re-encoded to a more compressed file, if needed.

This proposed new workflow's need for automated transcoding processes can be met through the watch folder program that has recently been developed by Engineering IT. The watch folder program can perform a series of actions on video files that are placed in a particular directory. The program "watches" that directory, and when prompted, will perform automated tasks on the files stored there. As a result, the Transfer Engineer could place recently captured uncompressed video files into the folder and prompt the program to run on those files. The program could then automatically create the FFV1 encoded preservation master file and the MPEG-4 encoded web access copy. This watch folder program can also be used to perform metadata creation and extraction functions, which will be described in the following sections and in the following chapter on Born Digital Programs. At the time of writing this recommendation, the watch folder program has not yet been implemented and some of the functionality proposed here has not been scripted. Testing and implementing the program will be an important step, and one which may lead to unforeseen hurdles. Stakeholders in the Legacy Programs workflow, such as the Transfer Engineer, the Archivist, Engineering IT, and Web IT, should communicate regularly as the program is being implemented to ensure that the program is running properly and that everyone's needs are met by the new workflow.

The recommended new file formats for preservation and access are:

- **Preservation Master File:**
  Container: .Mov (Quicktime)
  Video codec: FFV1
  Audio codec: PCM, 16 bit, 48 kHz
  Chroma subsampling: 4:2:2
  Frame size: 720x486
- **Access File:**
  Container: MP4
  Video codec: h264
  Audio codec: aac, 48 kHz, 128
  Chroma subsampling: 4:2:0
  Frame size: 946x720

Section 4.3: MediaConch

At the time of writing this report, LPB is using v16.12 of the MediaConch software. MediaConch is a new application developed using the MediaInfo software library, designed with media preservation specifically in mind. The application does many things, from exporting MediaInfo and MediaTrace reports to fixing mal-formed video files. As a part of the new digital preservation procedures at LPB, **MediaConch will be used as automated quality control and a policy checker**. According to the MediaConch FAQ, "Quality control can be better monitored through MediaConch through algorithmic detection of conformance errors as well as the supplemental institution-based policy conformance checker. Since files are checked in a systematic way, preservationists can know definitively whether or not the file is working or how the file has changed since the last time it was reviewed (whether that is from previous quality analysis or during digitization, ingestion, or migration)."[3]

Two policies have been created for LPB, using a recently produced preservation master file and a web encoded file as a template (how to create policies is described later in this section). **MediaConch will check newly created files to ensure that the fields in the MediaInfo output report match the fields of the two template files**. In effect, the MediaConch software assures that the files are encoded to LPB's standards and that they have not been corrupted or otherwise mal-formed.

In the future, the MediaConch reports can be used as Quality Assurance, a check to make sure that newly created files are encoded as they should be. It is possible for web encoded files to go through the wrong automated encode process or for the encode settings of the preservation master to be accidently changed. This report will help **catch those errors at the point of file creation**.

The MediaConch reports can also be used to check against file corruption. For example, a preservation master file, LPBLC57.imx.mxf, was taken off of an LTO-6 tape for testing as a part of this project. The file functions normally, with the exception of approximately 3 seconds at the very beginning of the file, where the first frame is frozen as a static image. Whether this file changed when it was moved off of the LTO-6 tape, while it was stored on the tape, or before it was moved onto the tape, is unknown. While a checksum can help determine *when* the error occurred, the MediaConch report can help determine *the type* of error that occurred. This file, LPBLC57.imx.mxf, which happens to be b-roll of a story on the 1990 U.S. Senate race, contains very little embedded metadata, making the file invalid and unreadable by the MediaConch software. This suggests that the error in the file is located in the header, and a lack of embedded metadata is causing the video playback software to struggle to read the first few frames of the file. If LPB had been creating MediaConch reports at the time that this file was created, it would be possible to ascertain whether the file was encoded this way upon creation or if corruption occurred after the fact.

[3] FAQ. MediaConch. https://mediaarea.net/MediaConch/documentation/FAQ.html

As LPB is currently researching new software and hardware for encoding digital audiovisual material, the process through which MediaConch reports will be created as part of this new workflow is still to be determined. For Legacy Programs, Engineering IT has recently built the aforementioned “watch folder” on the LDMA computer that will automatically perform a variety of processes on a preservation master file once it has been created.

At the time of writing this document, the watch folder program has been designed and created, but not yet implemented. The current plan is to begin using the watch folder program for metadata creation and extraction processes, like creating MediaConch reports, when the Transfer Engineer beings prepping files for the next LTO tape, number 15. The watch folder can be “pointed” to a particular directory through a GUI. The Transfer Engineer will name the preservation master files and place them in this directory. At the end of the day, the Transfer Engineer will prompt the watch folder program to process the preservation master files. The program will create the MediaConch report, as well as other technical metadata files discussed later in this chapter, and package them with the preservation master in a directory named after the preservation master’s filename. As mentioned in Section 4.2, the functionality of the watch folder program could be expanded to include transcoding video files, but the need for transcoding files is dependent on adding the Analog-to-Digital converter to the Legacy Programs workflow, which has not yet been done. At this time, the initial implementation of the watch folder program will only include the creation of metadata files, and the “packaging” of these metadata files with their corresponding video files.

The watch folder program has a “verify” function that inspects a completed “package” to verify that is has the correct number and types of files within it. A part of this “verify” function that has been discussed would search a MediaConch report for a “fail” and report this through the program’s GUI. If this part of the “verify” function is not implemented, then the Transfer Engineer will need to open each MediaConch report, as described in the step-by-step process below.

This concept of “packaging” a preservation file with its associated metadata is based loosely on a digital preservation standard, the Open Archival Information System (OAIS) reference model, described in the International Standards Organization’s ISO 14721:2012.[4]

For documentation purposes, and because the watch folder program has not yet been implemented, a simpler, and more manual method for creating MediaConch reports is listed below.

MediaConch reports can be generated on the LDMA computer using MediaConch policy XML files, and a .bat file, or Windows “batch file,” which will run a script on the file by dragging and dropping the video file over the .bat file’s “gear” icon. This policy has not been enacted yet, but could serve as a “stop gap” before the watch folder, or a different solution, is pursued. As documentation, the .bat file’s script is as follows:

[4] Space data and information transfer systems -- Open archival information system (OAIS) -- Reference model. ISO 14721:2012. Geneva, Switzerland : ISO. http://www.iso.org/iso/catalogue_detail.htm?csnumber=57284

- CreateMediaConchReport_DragAndDrop.bat

```
For %%F in (‘%1’) do (
MediaConch  %1 -p C:\Users\tjustice\Documents\LPB_AccessCopySD.xml -fh
> %%~nF_MediaConch.html)
```

This script relies on the policy XML file, which in this example has the file path: “C:\Users\tjustice\Documents\LPB_AccessCopySD.xml.”

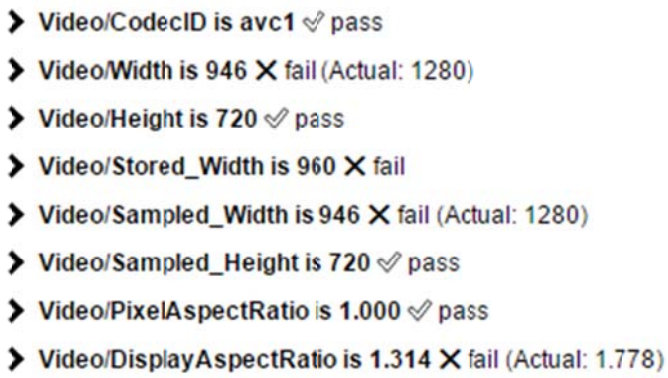
The MediaConch policy checker reports will be exported as HTML files. They will be named after the preservation master file that was either dropped in the watch folder or dragged over the .bat file. The file naming convention for these MediaConch reports adds a “_MediaConch.html” suffix to the existing file name. Therefore, a preservation master file named “LFOLK-824.MXF” would have a MediaConch report named “LFOLK-824_MediaConch.html.”

The resulting HTML file MediaConch reports can be viewed in any web browser. Once the MediaConch file has been created, the Transfer Engineer will do the following:

1. Open the file, and confirm that the file has “passed” the MediaConch policy:

   This will likely be true for most files, unless an error has occurred.

2. If the file has failed the MediaConch policy, it should be re-encoded.
   2.1. If the file was a Preservation Master, then encoding settings on the XDCAM encoder and the FrameSync should be checked.
   2.2. If the file was a web encoded access copy, then the Phil3k encoding process should be checked. Contact Engineering IT.
3. If the encoding process for the failed file has been checked, and nothing seems out of the ordinary, consult the rules of the policy to determine what elements of the file do not conform to the policy. The rules, based on MediaInfo fields, are listed in the HTML file:



In the example above, the MediaConch report shows that the file in question was encoded at a different resolution (1280x720) than the policy dictated (946x720). This is shown here to demonstrate how a MediaConch report can help troubleshoot how a file can be encoded erroneously.

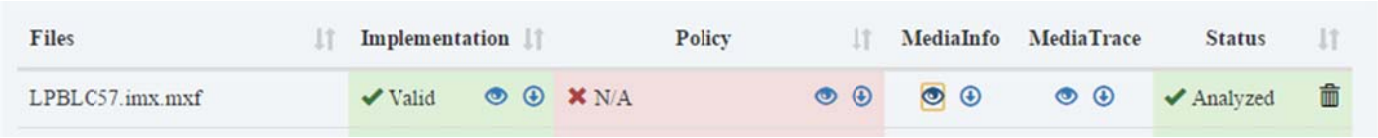
MediaConch policies can be edited and new policies can be created. This is most easily performed through the MediaConch GUI. See the instructions for editing a MediaConch policy (#1) and creating a new policy (#2), below:

1. It is possible that LPB will need to change rules of a policy or create new policies, as the encoding processes are updated regularly, or Preservation Master encodings change. To edit an existing policy, follow these steps:
    1.1. Open the MediaConch GUI (which can be downloaded for free here: https://mediaarea.net/MediaConch/download.html)
    1.2. Navigate to the “Policies” tab, using the button on the top right side of the window and scroll down to the “Import Existing Policy” section.
    1.3. Click on the “Choose file” button, and select the existing policy XML file. The current policies are named “LPB_AccessCopySD.xml” and “LPB_BroadcastMasterSD.xml”. Then press the “Import Policy” button.
    1.4. The imported policy will then be in the policy list, with the individual rules listed below in a tree structure. Click on a rule to view the details of the rule on the right side of the screen.
    1.5. Edit the rule by changing the values of the drop down menus and clicking the orange “Save” button, or delete the rule by clicking the red “Delete” button.
    1.6. When finished, export the policy. Click on the name of the policy at the top of the tree structure, and then click the orange “Export Policy” button.
    1.7. Insert the resulting XML file into the scripts that use that policy, such as the scripts in the watch folder program, in place of the existing policy.

2. A new MediaConch policy can be created by following these steps:
    2.1. Open the MediaConch GUI (which can be downloaded for free here: https://mediaarea.net/MediaConch/download.html)
    2.2. Navigate to the “Checker” tab, using the button at the top of the window.

2.3. Identify a file that can serve as a template for the policy. A policy should be used for files that will be encoded through a specific process with settings that do not change. Choose a file that is created through this process, with these settings, as the template file.

2.4. Check the template file by clicking on the “Choose Files” button, and then the orange “Check Files” button. The results will appear at the bottom of the screen with the Implementation and Status reports highlighted in green. Click the “Eye”



icon under the MediaInfo header:

2.5. Scroll to the bottom of the MediaInfo report and click on the orange “Create policy from MediaInfo Report” button.

2.6. The policy will now appear on the Policies page (click the “Policies” tab to view) named after the file name.

2.7. Check the new policy by running a similarly encoded file against the policy through the Checker. The file will likely fail! MediaConch copies over all of the MediaInfo report fields, some of which are likely to change, even when a file is encoded using the same settings. An example of this is the average bit rate on a file encoded with a variable bit rate.

2.8. Edit the policy (refer to the procedure above for step by step information), deleting rules that fail regularly against files that are known to be encoded correctly, until files are passing consistently.

2.9. Export the policy. Click on the name of the policy at the top of the tree structure, and then click the orange “Export Policy” button.

2.10. Insert the resulting XML file into the scripts that use that policy (either the Phil3k scripts or the .bat file used on the Preservation Masters), in place of the existing policy.

Section 4.4: MediaInfo as XML

At the time of writing this report, LPB is using v0.7.91 of the MediaInfo software. The MediaInfo application allows a user to see various types of technical metadata that are embedded in the file or is interpretable from the file’s structure. This metadata can then be stored as a record which provides future users with a great deal of information without having to open or view the file. This information, such as the runtime of a video file, the sample rate of an audio file, or the resolution of a still image file, is formatted to MediaInfo’s various output options. Until recently, these options mostly only controlled the verbosity of the output. LPB has been storing text files of MediaInfo reports while planning a methodology for importing these files into the archive database.

MediaInfo can now export reports in fields that comply with the PBCore 2.0 data structure standard. The LPB database also conforms to the PBCore standard, making the crosswalk between the MediaInfo reports and the database less complicated. Reports from the files stored on the web server and the LTO-6 tapes were batch created and added to the database. **Moving forward, MediaInfo reports will be created as PBCore 2.0 compliant XML files**.
MediaInfo reports from the various types of programs LPB creates will all need to be imported into the archive database, whether they are preservation masters of Legacy Programs or web encoded access copies of new material.

Under the current workflow at LPB, the Phil3k automated processes can be utilized to create MediaInfo reports of **web encoded access copies**, and deliver those reports to various locations. MediaInfo reports for **preservation masters** must be created manually.

However, as mentioned in the MediaConch section, the current plan for the future Legacy Programs workflow is to use a "watch folder" on the LDMA computer, which will perform several processes on preservation masters once they are added to this folder. The creation of MediaInfo reports should either be automated through this watch folder or automated through other means. Similar to the MediaConch workflow, a drag-and-drop .bat file could be used and is listed here as documentation:

- CreateMediaInfoReport_CopyToVault3.bat
  ```
  for %%F in ('%1') do (mediainfo --output=PBCore2 %1 >
  %%~nF_MediaInfo.xml
  copy %%~nF_MediaInfo.xml \\vault3\archive\MediaInfo_XML)
  ```

This script creates a MediaInfo report as a PBCore 2.0 compliant XML file, named after the input video file, and sends a copy to the "Vault3" network shared drive in the "MediaInfo_XML" directory, within the "archive" folder. The archive folder on the Vault3 server will serve as a staging area for MediaInfo reports to be imported into the archive database.

MediaInfo reports should be generated for both files created as part of the Legacy Programs workflow (preservation master and access copy), and stored with those files on LTO-6 tape, as well as being stored in the Vault3/Archive directory. The file naming convention for MediaInfo files is to add a "_MediaInfo.xml" suffix to the corresponding video's filename. For example, the MediaInfo report for a web encoded file "LFOLK-824_iPod.mp4" would be "LFOLK-824_iPod_MediaInfo.xml." It is imperative that a **unique file name be given to web encoded copies** and that they are distinguishable from preservation masters by more than a file extension because the naming conventions for the various metadata files created through automated processes do not include the original video file's extension.

The files that are staged in the "archive" folder on the "vault" shared drive are to be imported into the database through Microsoft SQL. To facilitate this import, a metadata crosswalk from the MediaInfo PBCore output to the database fields was recently created, which requires the creation of new fields in the database. LPB's Web IT manager has been researching a strategy

to link the data in the XML files to the records in the database. However, the creation and display of new fields in the database interface will necessitate the contracted services of a programmer.

Section 4.5: Md5deep

A checksum is the result of an algorithm applied to raw data that yields a unique result. Individual bits of information, zeroes and ones, are applied to this algorithm in such a way that if any of the bits change, the checksum will also change.

A checksum can function as a snapshot of a particular file's state at a given moment. To determine if a file has changed over time, one can compare the checksum of the existing file against a checksum of the file in its previous state. If the checksums are identical, then the files are identical. If the checksums are not the same, then there are at least some small differences between the two files.

The majority of data corruption happens upon transfer from one device to another. To guard against losing data in situations like these, a checksum can be used to verify that no change has occurred upon transfer. To this end, one of the automated processes performed on video files saved for preservation will be to create a "checksum sidecar" file. This is a text file that will be named after its corresponding video file and contain the checksum of that video file. The proposed watch folder program can create these files automatically. The naming convention for checksum side car files adds a ".md5.txt" suffix to the video file's filename. Therefore, the checksum side car for "LSWI-1340.MXF" would be "LSWI-1340.md5.txt." Note that this suffix does not include the original file's extension, and therefore the "_iPod" suffix within the filename of access copies will be very important for differentiation between the two video files' side cars.

To be able to quickly and easily ensure that the files being moved to LTO tape are not damaged during transfer, create a checksum manifest using the md5deep software. At the time of writing this report, LPB is using v4.4 of the md5deep software. This list will also serve as an inventory of the LTO tapes and a reference for checksums in the future.

LPB keeps files that will be moved to LTO-6 in a "staging directory" named after the LTO tape where the file will eventually be stored. Creating checksums is a time consuming process because the file has to be read and the checksum has to be calculated using the data the computer has read. The result, however, is well worth it, because the checksums provide a guarantee that files were not corrupted during the transfer and offer a method to confirm files have not been corrupted in the future.

Before moving any files to LTO-6 tape, do the following:

1. Navigate to the “staging directory” through the Command Prompt:
    1.1. Open the command prompt.
    1.2. Type:
    `I:`
    1.3. Press enter.
    This has navigated the command prompt to the I:\ drive, the equivalent to opening that directory in Windows Explorer.
    1.4. Now type:
    `cd`
    The “cd” command stands for “change directory” and is used to navigate between folders in the command prompt. First, one must specify which directory to change to.
    1.5. Begin to type the name of the staging directory where all of the video files are stored into the command prompt. This directory is currently named “LDMA_LTO##.” Type the first 2 or 3 letters (i.e. “LDM”) and then press “tab” and the command line will finish the name of the directory. It should look something like this:
    `cd LDMA_LTO15`
    Press Enter.
    1.6. To view the contents of the directory and confirm that the command prompt has navigated to the correct location, type:
    `Dir`
    Press Enter.
    This should display the contents of the directory, which should be individual directories for each archived program, named using the program’s local NOLA code.
2. Run the “checksum_manifest_for_RAID.bat” file on the “staging directory”
    2.1. Drag and drop the “checksum_manifest_for_RAID.bat” into the command prompt window. Ensure that the command prompt window is “active” or highlighted, and press enter.
    2.2. The application will need to read each file and calculate a checksum. This will likely take several hours.
    2.3. The command prompt will display the time remaining to process each file, but not the cumulative time remaining.
    2.4. **If the process must be stopped at any point, press “Ctrl” and “C” at the same time.** The command prompt will ask if you wish to stop the batch process. This may take a moment. Once the prompt appears, type “Y” and press enter.
    2.5. When the process is finished, the checksums will be saved to a text file titled: “checksum_manifest_for_RAID.txt”. This text file will be located in a directory on the Desktop. Briefly check the text file to ensure it looks right.
    2.6. **Rename “checksum_manifest_for_RAID.txt” to include the LTO tape number**. **This is very important.** The script is designed to be reusable, but

unless the file name is changed, it will cause problems the next time this process is performed.

2.7. Back up the checksum manifest onto the \\vault3\Archive\Checksum_Manifest drive, using the shortcut on the Desktop.

3. Move the files onto the LTO-6 tape.
4. Navigate to the LTO-6 tape through the Command Prompt:
   4.1. Open the command prompt.
   4.2. Type into the command prompt:
   `D:`
   and press enter.
      4.2.1. **Note**: the “D:” drive is the default drive the LTO tape machine will mount to, but if an external hard drive or other device is mounted to the LDMA computer, the next available letter will be used. Confirm that the LTO tape is mounted to the “D:” drive before performing this step.
5. Run the “checksum_manifest_for_LTO.bat” file on the LTO-6 tape
   5.1. Drag and drop the “checksum_manifest_for_LTO.bat” into the command prompt window, and press enter.
   5.2. The application will need to read each file and calculate a checksum. This will likely take several hours.
   5.3. The command prompt will display the time remaining to process each file, but not the cumulative time remaining.
   5.4. **If the process must be stopped at any point, press “Ctrl” and “C” at the same time.** The command prompt will ask if you wish to stop the batch process. This may take a moment. Once the prompt appears, type “Y” and press enter.
   5.5. When the process is finished, the checksums will be saved to a text file titled: “checksum_manifest_for_LTO.txt”. Briefly check the text file to ensure it looks right.
   5.6. **Rename “checksum_manifest_for_LTO.txt” to include the LTO tape number**. **This is very important.** The script is designed to be reusable, but unless the file name is changed, it will cause problems the next time this process is performed.
   5.7. Back up the checksum manifest onto the \\vault3\Archive\Checksum_Manifest drive, using the shortcut on the Desktop.
6. Compare the two text files using the FC command.
   6.1. Type into the command prompt:
   `FC`
   6.2. Drag and drop the two text files from the “manifest” directory on the desktop into the command line. Ensure that there is a space between the first file path and the second file path.
   6.3. Press enter.
   6.4. If no file corruption has occurred, the command line output should read:
   “`Comparing files C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_RAID14.txt and`

```
C:\USERS\ECOLLOTON\DESKTOP\MANIFESTS\Checksum_manifest_for_LTO14.
txt
FC: no differences encountered"
```

6.4.1. If differences were encountered, then the files on the RAID and the files on the LTO tape do not match. This means either something is missing or files were corrupted. FC will report these differences by quoting lines from the two manifests to demonstrate the difference. Like this:

```
"*****
C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_R
AID.txt
d41d8cd98f00b204e9800998ecf8427e  LSWI-3153_iPod.mp4
d41d8cd98f00b204e9800998ecf8427e  LSWI-3153.MXF
*****
C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_L
TO.txt
d41d8cd98f00b204e9800998ecf8427e  LSWI-3153_iPod.mp4
f68c6f37590345154499bd39423dfc0f  LSWI-3153.MXF
*****"
```

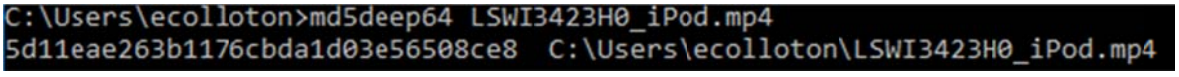
6.4.2. In the example above the checksum for the LSWI-3153.MXF file has changed. See how the second line of text from "Checksum_manifest_for_RAID.txt" does not match the second line of "Checksum_manifest_for_LTO.txt"

7. The checksum manifests are valuable records. Be sure to back them up to the \\vault3\Archive\Checksum_Manifest directory so that the archivist can access them. Please keep a copy on the LDMA computer as well.

Using md5 checksums for troubleshooting

The checksum manifest's primary function is to ensure that files are not corrupted when they are moved onto or off of the LTO tape. However, they also serve a tertiary purpose of allowing LPB to trace the provenance of a corrupted video file. If a file is retrieved from a LTO tape, and the file is corrupted or not playing back appropriately, use the following steps to trace the origin of the error:

1. Create a new md5 checksum of the file that is presenting an error.
   1.1. When using the LDMA computer, open the command prompt and type: "Md5deep64".
   Drag and drop the file into the command prompt window and press enter:



   1.2. On any other Windows computer, open the command prompt and type: "certUtil -hashfile," drag and drop the file into the command prompt window, and

then type “MD5” after the file name:

```
C:\Users\ecolloton>certUtil -hashfile LSWI3423H0_iPod.mp4 MD5
MD5 hash of file LSWI3423H0_iPod.mp4:
5d 11 ea e2 63 b1 17 6c bd a1 d0 3e 56 50 8c e8
CertUtil: -hashfile command completed successfully.
```

2. Compare the new md5 checksum against the original. The original checksum will be stored in a text file with the same name as the file. The original checksum will also be stored in a “manifest” file that will be stored on the \\vault3\Archive\Checksum_manifests network shared drive, as well as the LDMA computer, and the Archivist’s computer.
3. If the original checksum does not match the new checksum, then the file has become corrupted since it was moved onto the tape. **Now the goal is to determine if the file on the LTO tape is corrupted or if the file copied off of the LTO was corrupted when it was moved off of the tape** (the latter is much more likely). Create a new checksum for the file that is stored on the LTO tape, using the same procedure outlined in step 1.
    3.1. If the checksum from the file stored on the LTO tape matches the original checksum, then the file has not changed since it was moved onto the tape. Therefore, the new copy of the file is likely the only corrupted file. Attempt to copy the file off of the LTO tape again.
    3.2. If the checksum from the file stored on the LTO tape *does not match* the original checksum, the file stored on the LTO tape has changed since the file was moved onto the tape. This is likely a sign of tape degradation. If this happens, other files on the tape have also likely been corrupted. Take the following action:
        3.2.1. Retrieve the copy of the LTO tape stored at the transmitter in Alexandria.
        3.2.2. Create a new manifest of the LTO tape and compare the new manifest with the original (stored in the tape library). Follow the steps in the previous section (the Transfer Engineer should be familiar with this process from creating and comparing manifests).
        3.2.3. After retrieving the LTO tape from Alexandria, create a manifest for this tape as well and compare the results. If the manifest of the Alexandria LTO tape is identical to the original manifest, this is a sign that files on the Baton Rouge LTO tape have corrupted over time. They should be replaced with the files on the Alexandria LTO tape. Copy the Alexandria LTO tape onto the LDMA RAID and back out to a new LTO tape.
        3.2.4. If the manifest of the Alexandria LTO tape is not identical to the original manifest, this could mean files were corrupted upon transfer to one or both of the LTO tapes. Identify **preservation masters** (MXF files) with checksums that are different. These files are likely corrupted. New preservation masters should be made for this material from the original analog videotape.
4. If the checksum of the file that is presenting an error matches the original checksum, then the error was present in the original file. While this does not help one repair the damaged file in question, it does inform LPB that the error is not caused by the LTO tape and that the rest of the files on the tape are not at risk of degradation.

Section 4.6: Format Migration - LTO

LPB currently stores preservation masters, web encoded files, and associated technical metadata on two identical LTO-6 tapes for preservation. One LTO tape is stored onsite at LPB headquarters in Baton Rouge and the other is stored at the transmitter in Alexandria.

For the Legacy Programs, the next long-term storage format migration will be to LTO-8, a generation of LTO tape which has not yet been released. (The Born-Digital Programs section will discuss LTO format migration in depth) LTO tapes are read-only backwards compatible for up to two generations. They are read and write backwards compatible to one generation. As discussed in section 5.3 of this document, when LPB migrates to LTO-8, the migration of LTO tapes in the Scalar robot will have already occurred. This means that all material archived to LTO tape will be of the same generation. When planning for the eventual migration to LTO-8, LPB should consider consolidating LTO workflows. One possibility is moving the process of writing to LTO tape to the Scalar robot as opposed to the drive mounted in the LDMA computer.

Recommendation (1 of 2):
Migration from LTO-6 to LTO-8
It is recommended that LPB follow the release of LTO-8 and plan for a migration accordingly. The price of LTO-8 tapes will likely drop significantly upon the release of LTO-9, which could serve as a mechanism to trigger a migration.

Recommendation (2 of 2):
Make backup copies of LTO-6 tapes stored at LPB
It is considered best practices in the field of digital preservation to have two copies of material on separate hardware, and a third copy in a geographically disparate location. LPB is currently one copy short, with one tape stored at the station in Baton Rouge, and the other at a transponder in Alexandria.

The LTO-6 tapes in the LPB tape library should be duplicated. This duplication could be handled one of two ways. For the first option, LPB could handle the duplication of these tapes manually. Given that the cost of LTO tapes is relatively low, this option only requires the investment of time and existing resources. That is not to say that the investment would not be significant. It will take several hours to move data off of one tape and then several hours to confirm that the data was copied completely and correctly. This data would then need to be written off to a new tape and then once again verified. This process would then need to be repeated for 14 tapes (at the time of the writing of this document). This could take approximately 3 weeks. If there are delays or the Transfer Engineer is needed for a different project, the process could take significantly longer.

The other option would be to purchase or rent an LTO-6 tape duplicator and use that device to copy the contents of the existing LTO-6 tapes onto new LTO-6 tapes. While this device would require greater financial investment from LPB, it would save a great deal of time during the initial duplication of tapes as additional backups. If purchased, the tape duplicator could save time and

simplify processes in the future, as new tapes are written to and require duplication. Currently, multiple copies of LTO tapes are created individually, by writing to one tape, and then the other. The LTO tape duplicator could be used to create two of the three LTO tape copies of new material, saving time whenever the Transfer Engineer finishes a tape. The need to copy the data off of one LTO tape and move it to another will be present in LPB's workflows for the foreseeable future and the use of an LTO-6 tape duplicator would meet this need until LPB adopts LTO-8, likely several years from now.

If LPB chooses to create backup copies of LTO-6 tapes manually, the process would require the use of the LDMA RAID computer and the time of the Transfer Engineer. **The storage space on the LDMA RAID that is typically used to store digitized material can be used as a staging area for material copied off of an existing tape, before it is written to a new tape.**

The following procedure can be used to copy files off of the tape, confirm their successful transfer, and then write them to a new tape. Each step of this procedure will take several hours because it will involve moving many large files, reading them, and moving them again.

1. Copy material stored on LTO-6 onto the LDMA RAID drive.
    1.1. First, check that the LTO tape is mounted and accessible to the computer's operating system as the "D:" drive using the LTFS Configurator application.
    1.2. Open the command prompt and type:
    `robocopy D:`
    Then drag and drop the destination folder into the command prompt. Be sure to use the actual folder and not the desktop shortcut to the folder. Also, ensure that there is a space between "D:" and the destination file path. Then type:
    `/E`
    The result should look like this:
    `robocopy D: I:\LDMALTO14 /E`
    1.3. Then press enter.
    This command will copy all material that is stored on the LTO tape into the "staging directory" on the "I:" drive.
2. Create a checksum manifest for the newly copied material.
    2.1. Navigate to the "staging directory" through the Command Prompt:
        2.1.1. Open the command prompt.
        2.1.2. Type:
        `I:`
        2.1.3. Press enter.
        This has navigated the command prompt to the staging directory, the equivalent to opening the directory in Windows Explorer.
        2.1.4. To view the contents of the directory and confirm that the command prompt has navigated to the correct location, type:
        `Dir`
        This should display the contents of the directory, which should be

individual directories for each archived program, named using the program's local NOLA code.

2.2. Run the "checksum_manifest_for_RAID.bat" file on the "staging directory"

2.2.1. Drag and drop the "checksum_manifest_for_RAID.bat" into the command prompt window, and press enter.

2.2.2. The application will need to read each file and calculate a checksum. This will likely take several hours.

2.2.3. The command prompt will display the time remaining to process each file, but not the cumulative time remaining.

2.2.4. **If the process must be stopped at any point, press "Ctrl" and "C" at the same time.** The command prompt will ask if you wish to stop the batch process. This may take a moment. Once the prompt appears, type "Y" and press enter.

2.2.5. When the process is finished, the checksums will be saved to a text file titled: "checksum_manifest_for_RAID.txt". This text file will be located in a directory on the Desktop. Briefly check the text file to ensure it looks right.

2.2.6. **Rename "checksum_manifest_for_RAID.txt" to include the LTO tape number**. **<u>This is very important</u>.** The script is designed to be reusable, but unless the file name is changed, it will cause problems the next time this process is performed.

3. Compare the new checksum manifest with the existing one using the FC command.

3.1. Type into the command prompt:
`FC`

3.2. Drag and drop the two text files from the "manifest" directory on the desktop into the command line.

3.3. Press enter.

3.4. If no file corruption has occurred, the command line output should read:
"`Comparing files C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_RAID14.txt and C:\USERS\ECOLLOTON\DESKTOP\MANIFESTS\Checksum_manifest_for_LTO14.txt`
`FC: no differences encountered`"

3.4.1. If differences were encountered, then the files on the RAID and the files on the LTO tape do not match. This means either something is missing or files were corrupted. FC will report these differences by quoting lines from the two manifests to demonstrate the difference. Like this:
"`*****`
`C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_RAID.txt`
`d41d8cd98f00b204e9800998ecf8427e  LSWI-3153_iPod.mp4`
`d41d8cd98f00b204e9800998ecf8427e  LSWI-3153.MXF`
`*****`
`C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_L`

```
TO.txt
d41d8cd98f00b204e9800998ecf8427e  LSWI-3153_iPod.mp4
f68c6f37590345154499bd39423dfc0f  LSWI-3153.MXF
*****"
```

3.4.2. In the example above the checksum for the LSWI-3153.MXF file has changed. See how the second line of text from "Checksum_manifest_for_RAID.txt" does not match the second line of "Checksum_manifest_for_LTO.txt"

4. Remove the LTFS mapping of the LTO-6 tape using LTFS configurator and eject the tape.
5. Mount a new, blank tape.
6. Move files from the LDMA folder to the new LTO-6 tape.
   6.1. Open the command prompt and type:
   `Robocopy`
   6.2. Then drag and drop the staging directory into the command prompt
   6.3. Then type:
   `D: /E`
   The result should look like this:
   `Robocopy I:\LDMALTO14 D: /E`
   6.4. Then press enter.
7. Create a checksum manifest of the new LTO-6 tape.
   7.1. Navigate to the LTO-6 tape through the Command Prompt:
      7.1.1. Open the command prompt.
   7.2. Type into the command prompt :
   `D:`
   and press enter.
      7.2.1. **Note**: the "D:" drive is the default drive the LTO tape machine will mount to, but if an external hard drive or other device is mounted to the LDMA computer, the next available letter will be used. Confirm that the LTO tape is mounted to the "D:" drive before performing this step.
   7.3. Run the "checksum_manifest_for_LTO.bat" file on the LTO-6 tape.
      7.3.1. Drag and drop the "checksum_manifest_for_LTO.cmd" into the command prompt window and press enter.
      7.3.2. The application will need to read each file and calculate a checksum. This will likely take several hours.
      7.3.3. The command prompt will display the time remaining to process each file, but not the cumulative time remaining.
      7.3.4. **If the process must be stopped at any point, press "Ctrl" and "C" at the same time.** The command prompt will ask if you wish to stop the batch process. This may take a moment. Once the prompt appears, type "Y" and press enter.
      7.3.5. When the process is finished, the checksums will be saved to a text file titled: "checksum_manifest_for_LTO.txt". Briefly check the text file to ensure it looks right.

7.3.6. **Rename "checksum_manifest_for_LTO.txt" to include the LTO tape number**. **<u>This is very important</u>.** The script is designed to be reusable, but unless the file name is changed, it will cause problems the next time this process is performed.

7.4. Compare the two text files using the FC command.

7.4.1. Type into the command prompt:
`FC`

7.4.2. Drag and drop the two text files from the "manifest" directory on the desktop into the command line.

7.4.3. Press enter.

7.4.4. If no file corruption has occurred, the command line output should read:
"`Comparing files C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_RAID14.txt and C:\USERS\ECOLLOTON\DESKTOP\MANIFESTS\Checksum_manifest_for_LTO14.txt`
`FC: no differences encountered`"

7.4.5. If differences were encountered, then the files on the RAID and the files on the LTO tape do not match. This means either something is missing or files were corrupted. FC will report these differences by quoting lines from the two manifests to demonstrate the difference. Like this:
"`*****`
`C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_RAID.txt`
`d41d8cd98f00b204e9800998ecf8427e  LSWI-3153_iPod.mp4`
`d41d8cd98f00b204e9800998ecf8427e  LSWI-3153.MXF`
`*****`
`C:\USERS\TJUSTICE\DESKTOP\MANIFESTS\Checksum_manifest_for_LTO.txt`
`d41d8cd98f00b204e9800998ecf8427e  LSWI-3153_iPod.mp4`
`f68c6f37590345154499bd39423dfc0f  LSWI-3153.MXF`
`*****`"

7.4.6. In the example above the checksum for the LSWI-3153.MXF file has changed. See how the second line of text from "Checksum_manifest_for_RAID.txt" does not match the second line of "Checksum_manifest_for_LTO.txt"?

Section 4.7: Format Migration - Web Encoding

In the relatively brief time that LPB has been producing content for the web, several iterations of web encoded file types have been used. The "_web" and "_iPod" suffixes have been used inconsistently during that time, but the confusion created by briefly changing these suffixes in the past has meant that they have persisted. As the meaning of these suffixes is broadly understood by all of the LPB staff that interacts with these files, there does not seem to be a

need to change them at this time. While uniformity in access copies would be ideal, to re-encode access copies from preservation masters currently stored on LTO tape would be a significant investment in time and resources and is not a priority at this time.

The current encoding of 4:3 aspect ratio video files was conceived by Engineering IT Specialist Adam Richard. In order to avoid the black bars that surround a 4:3 image when viewed in a 16:9 window, referred to as “pillar bars,” LPB’s standard definition video is encoded for web at a non-standard resolution - 946x720. This resolution makes sense in context. It is simply a “720p” (or 1280x720) resolution with the area that would contain no picture information chopped off from either side. As this resolution is non-standard, it makes creating derivatives or otherwise transcoding the files somewhat less straightforward. For example, it limits one’s ability to use presets in video encoding applications. It would also make the video file a bit puzzling were it stripped of its context and “discovered” by a later user. Given that these files are inherently derivatives of other files, it is not a significant preservation concern.

- File Naming convention:
    - PL = Pledge
    - K = repeated episode with small change (Art Rocks with a new calendar)
    - SWIU = “Doughnut” episode, 2 min version of SWI
    - H = HD
    - _iPod = For SD content: as of 07/2016, web encoded 946x720 .mp4 file, before 07/2016, files were 480x360.
    - _iPod = For HD content: as of 07/2016 web encoded 1280x720 .mp4 file, before 07/2016 some _iPod files were encoded as 512x288, if there was not an “H” in the file name.

It is imperative that a **unique file name be given to web encoded copies**, such as the existing _iPod suffix, and that web encoded video files are distinguishable from preservation masters by more than a file extension because the naming conventions for the various metadata files created through automated processes do not include the original video file’s extension.

Section 4.8: Preservation Metadata

MediaInfo XML files, as well as Checksum Manifests for LTO tapes are currently stored on the “VAULT3” shared network drive in a directory labeled “Archive.” As MediaInfo files for legacy media will be created in the future through automated processes, this data will also be written to the same location. These MediaInfo reports and Checksum Manifests are also stored on the LDMA RAID. An ideal third location could be on the archivist’s workstation computer.

Recommendation:
Document Technical Provenance
In order to describe the provenance of archived files, LPB could include a document that describes signal flow and the creation of video files on each tape. This would include the

following list, as well as the settings the Transfer Engineer has configured in the AJA control panel:

- Reproduction Device (Video Deck):
    - Device Type (i.e. U-matic VTR)
    - Device Manufacturer
    - Device Model Name
    - Device Model Version
    - Device Model Serial Number
- Correction Device: AJA FS-1
    - Device Type (i.e. TBC): Frame Sync
    - Device Manufacturer: AJA
    - Device Model Name: FS-1
    - Device Model Version:
    - Device Model Serial Number:
- Capture Device
    - Device Type (i.e. U-matic VTR): XDCAM Encoder
    - Device Manufacturer: Sony
    - Device Model Name:
    - Device Model Version:
    - Device Model Serial Number
- Capture Software
    - Software Name: Content Browser
    - Software Proprietor: Sony
    - Software Version

Section 4.9: Roles and Responsibilities

Transfer Engineer

The engineer responsible for transferring analog media to digital formats.
Responsibilities include:

- Maintenance of analog and digital equipment
- Calibration of the digitization station
- Transfer of media from analog to digital
- Quality control
- Metadata extraction from newly created digital files
- Creating evidence of chain of custody through checksums
- Submission of media to archival storage

Engineering IT

- Support Transfer Engineer through maintenance and troubleshooting of the Phil3k automated processes. (As mentioned previously in this document, LPB is currently

searching for a replacement to the Phil3k and maintaining and providing support for this new workflow will also be a part of Engineering IT's responsibilities.)
- Designing and creating the proposed "Watch Folder" which will automate the creation of MediaConch, MediaInfo, and checksum sidecar files for video files created through the Legacy Programs workflow.

Engineering Department

- Maintenance of equipment and infrastructure.
- Research potential additions and changes to infrastructure (i.e. format migration from LTO-6 to LTO-8).

Web IT

- Maintenance of the archive database and the LDMA website.
- Importing MediaInfo XML reports into the database.
- Quality Control checks on web encoded files.

Archivist

- Description of material in archive database.
- Quality Control checks on web encoded files.
- Staging of analog videotapes to be migrated to digital formats.
- Prioritization of analog videotapes for preservation and digitization.
- Liaison between LPB and Louisiana State Archives (LSA).
- Collaborates with LSA staff to ensure cleaning of Umatic ¾" videotapes by SAMMA machine before transfer to digital formats.
- Oversees storage and transportation of analog video tapes between LPB and LSA.

Executive Producer

- Institutional knowledge of rights restrictions of LPB's material.
- Consultation on licensing LPB's material to other organizations, especially stations or other organizations that have an existing relationship with LPB.
- Administrative role in maintaining lines of communication across departments.
- Maintain accountability of individuals and departments to ensure that the goals of this project are being reached efficiently.

Section 4.10: Evaluation and Updating

The material covered in the Legacy Programs section of this document should be reviewed annually. In order to get a full and accurate perspective on the practicality and quality of these archival practices, everyone who is involved in the workflow, from the Transfer Engineer to the Executive Producer, should be involved in the conversation. In particular, new policies should be discussed and their effectiveness should be reviewed. Additionally, the "Roles and Responsibilities" section of this chapter, and subsequent chapters, is a proposed new way of documenting the practices of LPB staff and departments. Consider whether this method is an effective form of documentation and determine if it suits its purpose of managing and tracking

the many responsibilities by the variety of individuals necessary to archive LPB's productions. In general, this meeting can be used as a way to review how LPB is currently treating its archival materials, how it is documenting those archival actions, and if any changes are worth exploring.

Here are some questions that could yield helpful discussion during such a meeting:
Are any of these tasks causing problems in the workflow? Are the results of any of these tasks unhelpful or frivolous? Can metadata from a MediaInfo file be put to better use?
Are the roles and responsibilities outlined above still accurate? Are any of these responsibilities not being met? Could additional members of LPB staff be asked to take on new or existing responsibilities? Are our current means of documenting archival procedures working?
Does anyone have recommendations for improving the workflow?

Chapter 5: Born-Digital Programs

Section 5.1: Project/Purpose Statement

Just as the media LPB has produced in the past has value to the station and the public in the present, the material LPB currently produces holds value for producers and audiences in the future. The practical need to have access to high quality versions of recently produced material for regular television events, such as a year in review or a follow-up story, is only bolstered by the value these programs will hold at a later date when viewed through the lens of history.

As born-digital content, these contemporary programs have different attributes and different preservation risks than Legacy Programs. Compatibility across the various systems in a file's lifecycle yields different versions of the file at several points in its creation. The different storage devices involved in the broadcast and backup of a Born-Digital Program allow for different levels of accessibility. When to capture and archive a Born-Digital Program is less straightforward than its analog equivalent. These challenges must all be weighed against the ability to create a streamlined and successful workflow for preserving a program, while not inhibiting or inconveniencing the production and broadcast of new material.

As these programs are being produced currently, there is a unique advantage to collect valuable documentation and contextual information around these programs from the producers who help create the programs. Material like transcripts, contracts, releases, and other information is vital to the re-use of these programs. These documents are already produced in the normal course of creating the program and are most easily collected at the time of their completion, as opposed to weeks, months, or years after the show has aired. There is a growing effort in production archives to "push metadata upstream" in order to collect as much information as possible about a program at the time of its conception, when knowledge and documentation are easily accessible and centrally located.

The goal of this chapter is to describe the production environment and "lifecycle" of a LPB produced Born-Digital Program, to document the current procedures that LPB employs to preserve its material, and to look to the future to determine how best to improve these procedures as technology evolves and changes.

Section 5.2: Preservation and Quality Control

LPB's current production workflow relies on live captioning from LNS captioning service. Captions are encoded directly into the broadcast master MXF file, in compliance with PBS standards, through the Evertz Caption Encoder 8084(AD). Two captioned files are created during this process. The broadcast master is recorded at 35 mbps with a chroma subsampling of 4:2:0 onto the Harmonic Omneon playout server. A higher resolution file recorded at 50 mbps with 4:2:2 chroma subsampling is also recorded onto an XDCAM professional disk.

Currently, quality control of broadcast masters are performed by the Master Control Engineer to ensure that material with “digital artifacting” does not make it to air and that runtimes of programs are in keeping with the Traffic department’s schedule. Master Control Engineer Becky Pittman finds errors in material less than once a month and these errors are more typically with national programming, not local programming. All material that airs from the Harmonic Omneon playout server, the broadcast masters, are written to LTO-4 tape through automated processes governed by the Polaris software, which is designed to manage the Harmonic Omneon, as well as the Flashnet server, which acts as middleware between the Harmonic Omneon and the Scalar i500 LTO tape robot. The Scalar tape robot then retrieves previously aired programs when requested by the Master Control Engineer and the program is written back to the playout server. Locally produced material is flagged and stored together, which Engineering refers to as the “local group.” The “local group” is duplicated onto a second LTO-4 tape through an automated process, which typically happens overnight or when the Scalar robot is not in use. The duplicate copy is sent to Alexandria, where it is stored as an offsite backup.

This broadcast master is not the version of the program that is stored in the tape library. A “caption master” is recorded onto an XDCAM professional disk at a higher sample rate than the broadcast master and is then sent to the tape library. This copy does not receive a thorough quality control check and is only reviewed if the material must be retrieved from the disk. While it is a rare occurrence, in the past a program has not been properly recorded to the XDCAM disk and was not retrievable in that format.

From a production and on-air standpoint, the caption master is a backup and serves as protection against the loss of the broadcast master, a file written to the Omneon playout server. However, from an archival standpoint, the caption master is the best possible copy. Because this copy does not receive a thorough QC review, it represents a risk to the preservation of LPB’s born-digital programming.

Similarly, the caption master being stored on XDCAM and the broadcast master being written to the Omneon playout server means that a checksum for the video file cannot be generated. The transfer of the broadcast master to LTO-4 tape is entirely automated through the Flashnet server and the Scalar i500 LTO tape robot, so there is not an opportunity to create a checksum during this process either. Therefore, when copies of LPB’s born-digital programs, saved for preservation, are moved from one storage media to another, there is no way to confirm that data corruption did not occur in the process. Furthermore, if an error is encountered, there is no way to trace back when the error took place or if a previous version of the file would contain the same error.

Recommendation:
Any changes in the process of archiving and preserving Born-Digital Programs can now take advantage of the revisions in the Legacy Programs workflow. However, collecting checksums, MediaInfo reports, and MediaConch reports, requires a digital file. The highest quality file that is created for broadcast is the file written to the XDCAM disk with captions from LNS. This file can

be moved off of the XDCAM disk and onto the LDMA computer in much the same way that preservation masters in the Legacy Programs workflow are created today.

It is recommended that when a “caption master” is created on XDCAM, that the file be renamed from the XDCAM default file name (“C0001”) to the program’s NOLA code and episode number using the Content Browser application. The file could then be copied off of the XDCAM. This process can be performed by the Transfer Engineer who typically works at the LDMA computer workstation. The XDCAM can be “queued” for the Transfer Engineer by the Caption Engineer by placing the disk in a bin by the workstation. Once the caption master has been copied off of the disk, it can be placed on the Traffic cart as it would have been previously.

It should be noted here that the process of copying the file off of the XDCAM and onto the LDMA computer does present a risk of corruption or data loss, since the transfer of information from one device to another is a common site of such errors. Ideally, the caption master would be delivered as a digital file onto a computer that could create a checksum before the file was transferred anywhere (the benefits of a file-based workflow are discussed in greater detail in Section 5.4: Format Migration - XDCAM). In any event, this is **the highest quality captioned form of the show that LPB currently creates** and the most efficient way to access that file.

Once the file has been copied off of the XDCAM disk, a MediaInfo, MediaConch, and md5 checksum could be created for the Caption Master through automated processes. This workflow will use a similar process to the one applied to a preservation master from the Legacy Program’s workflow with a few exceptions.

The creation of MediaConch reports for the Caption Master file and its derivatives would require a different MediaConch policy. The application requires a set of “rules” to check a file against and the files created by the Legacy Programs workflow would need different rules. For example, the resolution of Legacy Program preservation masters would be different from contemporary Born-Digital Program HD content. While not the most elegant solution, it may be necessary to have two sets of automated processes for the different types of material that LPB hopes to archive. This could be done by repurposing the code from the recently developed watch folder program and simply having one watch folder application for Legacy Programs and one for Born-Digital Programs. The alternative option is a bit more complex from a programming perspective. It involves having the watch folder program identify which type of file it is using, based on the file format and embedded metadata, and then running the appropriate processes on the file. Engineering IT is aware of these two options and feels both are possible. It may be that the first solution, dual watch folders, is implemented temporarily, while the second, more robust solution is developed. This could potentially be beneficial if LPB chooses to change its preservation master file format for Legacy Programs (see Section 4.2), because having a different file format will make differentiating between a Born-Digital Program and a Legacy Program simpler from a programmatic perspective.

At this time, Engineering IT feels the watch folder program can be modified to suit the needs of both the Legacy Programs workflow and the Born-Digital Programs workflow. However, to

conserve staff time, these additions to the watch folder program will not be implemented until a new computer with greater processing power and a larger amount of storage is installed at the LDMA workstation.

Regardless, the end goal is to have a directory, which is named using the program's NOLA code and episode number, and contains a high-quality video file, a web encoded access copy of that file, and a corresponding MediaInfo report, MediaConch report and md5 checksum sidecar text file for each video file. This would ensure that LPB could collect technical and preservation metadata from Born-Digital Programs and it safeguards against the risks associated with XDCAM (discussed in further detail in Section 5.4: Format Migration - XDCAM).

Caption Master files and their associated metadata sidecar files could be staged on the RAID array linked to the LDMA computer and eventually moved on to multiple LTO-6 tapes with the Legacy Programs. Given the extent to which these files are tracked in the database, there is little risk in storing both Legacy Programs and Born-Digital Programs on the same LTO-6 tapes. In fact, the advantages of having additional metadata and a format agnostic storage strategy far outweigh this concern.

Section 5.3: Format Migration - LTO Tape

Broadcast masters of LPB content are currently archived on LTO-4 tapes automatically through the Flashnet Server middleware and the Scalar i500 tape robot. The LTO-4 format, which was introduced in 2007, is quickly becoming a preservation risk. LTO tapes are read and write backwards compatible for one generation and read-only backwards compatible for two generations. This means that LTO-4 tapes can be read by an LTO-6 drive, but not written to them. Engineering is already exploring LTO format migration solutions through Quantum, the vendor that produces the Scalar robot and with whom LPB holds a service contract. This process will involve the vendor sending out a technician to install LTO-6 drives in the current machine and helping to configure the migration. There are four LTO drives in the Scalar machine. To facilitate the migration from LTO-4 to LTO-6, not all of the drives will be replaced initially. By leaving one or more of the LTO-4 drives installed, LPB retains the ability to read from the existing collection of LTO-4 tapes.

At this time, a determination must be made as to which material currently stored on LTO-4 tape will be migrated to LTO-6 tape. It is essential that all material currently in the "local group," which stores backups of all LPB produced material, be migrated from LTO-4 to LTO-6. Failing to migrate this material to LTO-6 could likely lead to the eventual loss of some, or all of these backups, since LTO-4 tapes will not be read by any future LTO drives (after LTO-6). This migration should also include the off-site "local group" backup LTO-4 tapes, which are currently stored at the LPB transponder in Alexandria. Alternatively, new copies of the local group could be made on LTO-6 tape and sent to Alexandria, as opposed to migrating the data off of the tapes that are stored there now and then sending them back. This second strategy has the benefit of creating an additional copy of the material, although the LTO-4 backups will be stored on an obsolete media with the dwindling ability to be read or restored. Retrieving and re-writing

the Alexandria tapes does provide an opportunity to assess those backup tapes and to investigate if their storage environment has caused them to degrade at a different rate from the copies stored in Baton Rouge.

When evaluating the vendor's proposed process for migrating from LTO-4 to LTO-6, LPB should verify that the migration will include thorough checks for fixity and completeness. There must be a way to demonstrate that all of material that was stored on LTO-4 was successfully moved to LTO-6 and that no data was lost in the process. It is likely that these checks will be more time consuming, but ultimately, the additional time investment is worth the assurance that no data was lost. The processes of confirming a full and successful transfer of data could happen as a second process, after the files have been written to LTO-6 or built into the migration of data from LTO-4 to LTO-6 because many applications designed for such migrations include options to confirm successful bit-for-bit copying. Regardless of the methodology, if fixity checks are performed by the vendor and not by LPB, then a number of files should be selected as a sample and tested against the original files stored on LTO-4 to confirm that this process is working appropriately.

Recommendation:
Moving forward, verification that backup LTO tapes produced as a part of the born-digital programs workflow are identical - a bit-for-bit copy of the original tape - should be added to the Master Control engineer's responsibilities. Master Control is alerted when local group backup tapes are "full" and is responsible for replacing them in the Scalar robot. Adding a step to this process that confirms that the tapes are identical could double as a way to create an inventory of those files. While the Scalar robot and software uses a system of compression and indexing more complicated than the LTFS-based Legacy Programs LTO workflow, the scripts for indexing and validating the LTO tape copies could possibly be repurposed for this process as well (See the Md5deep procedure in the Legacy Programs section).

It is not known when the LTO-8 format will be released. "The LTO Program will say only that 'the technology provider companies (HP, IBM and Quantum) strive for release of new technology every 24–36 months.'"[5] Given that LTO-6 was released in December of 2015, it is reasonable to assume that LTO-8 will be released in early 2018, or even sooner. Preservation masters of "Legacy Programs" are currently stored on LTO-6. It would be ideal for all archival materials in LPB's collection to be stored on the same format, which will streamline retrieval of information and future migrations. With this in mind, it is recommended that both Legacy Programs and Born-Digital Programs should be migrated to LTO-8 simultaneously. While perhaps painful because the migration to LTO-6 will have occurred relatively recently, the benefits may outweigh the initial cost.

Having all content on the same format will mitigate risk due to a higher level of institutional investment in a single format. LPB would no longer need to invest in multiple types of LTO

[5] Frazer, Bryant. LTO Program Updates Roadmap for Next Four Tape Generations. September 11, 2014.
http://www.studiodaily.com/2014/09/lto-program-updates-roadmap-for-next-four-tape-generations/

tapes, making bulk orders more efficient. Troubleshooting processes will have benefits across program type, whether they are recently produced shows or legacy programs. Similarly, given the broader adoption, a broader level of experience across staff and departments would be more easily achieved.

With a newer iteration of LTO tape, fewer issues will likely be encountered given the growing adoption of LTO tape in large-scale data operations since the design and release of LTO-4. This higher level of investment will also reap streamlined retrieval of information from LTO tapes because either the Scalar robot or the LDMA workstation will be options for copying material off of the tape and onto a hard drive.

Section 5.4: Format Migration - XDCAM

The XDCAM format and its carrier, the Professional Disk, are not ideal for archiving and preservation. Introduced by Sony in 2003, the XDCAM will inevitably face obsolescence (likely sooner rather than later) as new formats become more popular and file-based workflows become the norm. Individual and independent storage media presents many challenges to digital preservation. The obvious risk is that the disks can be misplaced. The files stored on the disks cannot be monitored for data loss in the same way that assets uploaded to the database are (see Section 3.5).Similarly, storing files on XDCAMs prevents many preservation actions that could otherwise be automated. Furthermore, XDCAMs force a reliance on a proprietary storage format that requires a proprietary codec, both of which will inevitably become obsolete. While it is unlikely that camera-native encoding will become non-proprietary in the near future, the increased file size of higher resolution files, such as Ultra HD and 2k, will likely hasten the fall of XDCAM professional disks as the storage media du jour.

It is worth noting here that XDCAM disks may not be archivally sound. “May” being the operative word as very little data in terms of number of read/writes and life expectancy is available from independent sources. Sony claims that the disks have a lifespan of 50 years,[6] but this claim is dubious in light of scientific testing of other re-writable optical media devices, which have a highly variable life expectancy, from 1-25 years.[7] This fact coupled with the proprietary nature of the format and its native codec does not make the XDCAM an ideal long-term storage media. As noted in the previous section (Preservation and Quality Control), the XDCAM professional disk functions as a tertiary “backup” device for broadcast material. Nevertheless, it is important to note that content stored on XDCAM disks should not be considered “safe” and is far from permanent.

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[6] “Professional Disk Media.” Sony. 2012. https://pro.sony.com/bbsc/assetDownloadController/OpticalSellSheetfinal.pdf?path=Asset%20Hierarchy$Professional$SEL-yf-generic-276926$SEL-yf-generic-277819SEL-asset-347359.pdf&id=StepID$SEL-asset-347359$original&dimension=original

[7] Lunt, Barry. “How Long Is Long-Term Data Storage?” 2011. http://www.imaging.org/site/PDFS/Reporter/Articles/2011_26/REP26_3_4_ARCH2011_Lunt.pdf

Currently, XDCAM disks are pervasive in all aspects of the production workflow and are favored by editors for their ease in auto-populating Avid bins, as well as their native ability to create lower resolution proxies. The move away from this format will cause significant disruption in well-worn workflows, but is ultimately inevitable. Many producers and photographers at the station already shoot on a variety of other media, such as SD cards, and this is only likely to grow in popularity and prevalence.

Recommendation (1 of 2):
LPB should begin preparing for this transition as soon as possible by exploring methodologies to mimic popular capabilities of XDCAMs, such as the generation of lowres proxies across formats.

Newer formats are likely to be less robust than XDCAM disks, meaning they will likely be smaller (and therefore more difficult to label and easier to misplace), assume a high level of reuse (meaning they will store more data and be more expensive), and store data for less time (assuming these formats use solid state technology as opposed to optical encoding). With this in mind, the road ahead for storage media will likely mean that eventually LPB will not be able to rely on “field tapes” as storage media. From this perspective, investment in a greater amount of network attached data storage is inevitable.

Recommendation (2 of 2):
Moving to a file based workflow has many advantages. The biggest advantage is the ability to automate processes like quality control checks, metadata extraction, web encoding, and generating checksums. A file-based workflow is also more insular from format obsolescence. While technology evolves rapidly, the lack of dependency on a particular physical format, like XDCAM, increases the value of hardware in a media workflow, because this hardware can be used for a longer time period and be scaled up. When LPB inevitably moves to a 2K workflow, XDCAMs will likely not provide enough storage to remain a feasible production format. Format agnostic storage devices, such as a RAID or solid state drives, will still remain viable, albeit less spacious.

A file based workflow does create a need for more data storage. Files must be moved to a Network Attached Storage Device, or NAS, where they can be processed before being migrated to LTO tape. Additional networked drives could have many benefits beyond the archive. A recent production meeting on repurposing b-roll from weekly and monthly LPB produced programs identified a need for a “near-line” storage device that could store high resolution clips with high reuse value, such as footage of commonly discussed local areas or frequently mentioned subjects. Similarly, the Engineering department has been discussing the creation a digital “staging area” for content that is currently only written to LTO-4 tape. This repository would act as an “online” equivalent of the LTO-4 tape and would allow Master Control to pull previously aired material without having to add wear and tear on LTO tapes.

These needs could all be met with a single, scalable, storage device, meant for medium term storage. Material like b-roll could be stored on the drive more permanently, while recently

digitized analog video and recently produced born-digital programs could merely be “staged” on the device until a copy was moved to LTO tape for longer term storage.

Section 5.5: Production Documentation as Preservation Metadata

A great deal of documentation that increases a program’s re-use value is created by various departments and individuals at LPB. Much of this documentation is deposited in the archive, but the process is not formalized. Recently, producers began submitting more of the documentation that they create during the course of producing a show. The archive has also met with the Promotions department to discuss how the two departments can share information that they collect. The exploration of how best to collect documentation and information from other departments has been successful thus far and is still ongoing. Due to the evolving nature of this process, the following policies outlined in Section 5.6: Roles and Responsibilities should be considered a work in progress. As a practice is adopted and becomes habitual, streamlined or simplified methods for collecting the same information may be found. Additionally, there are still many forms of documentation for which there is not a regular practice in place for collecting. Connections and communication between the archive and other departments could be strengthened and new methods for collecting documentation could be built.

Section 5.6: Roles and Responsibilities

The task of preserving new programs produced by LPB cannot be the responsibility of an individual or a small team. The complexity of a digital broadcast master’s lifecycle makes contextualization, description and quality control too cumbersome for any one department or person. In order to ensure that LPB’s weekly and monthly programs remain discoverable and accessible, preservation actions must be inserted into the production workflow. Moreover, those involved with the production of this material must understand the importance of their involvement with preservation and archival tasks.

Producers

The material that producers create as a matter of course during the production process has significant archival value. LPB can avoid duplication of effort by collecting and preserving these materials as they are created. Producers of weekly and monthly programming should submit the following documents to the archive via the Production shared drive:

- Scripts
- Supers list
- Transcripts
- Credits
- Releases and other agreements

As many producers know, these materials will benefit them when considering whether to re-purpose material from the tape library. Having a script from a 20 minute segment makes searching for a 10 second sound bite much easier!

Editors

Recommendation:

While “turn around” times on weekly and monthly programs are short, minimum description of shots in an Avid bin will go a long way to promote re-use of LPB’s b-roll and other footage. There has been a shortage of available b-roll produced in-house recently. HD footage of common topics such as education, prisons, and healthcare, should be tagged and set aside for reuse. Similarly, b-roll of regional locales must be tagged in order to be discoverable.

The following list of keywords is designed to guide minimum description. Editors should start with the broadest description of a shot and then add more specific terms:

- Architecture
- Aerial
- Capitol - year
    - House
    - Senate
    - Lobbyist
- Coast
- Construction
- Drugs
- Politics
    - Voting
    - Campaign
    - Election
- Farms
    - Sugarcane
    - Soybean
- Festival
    - Mardi Gras
- Fishing
- Flood
- Food
    - Cooking
- Governor
- Hospital
- Hurricane
    - Name of Hurricane
    - Recovery
- Industry
    - Oil - Gas
    - Nuclear power
    - Pipeline
    - Oil Spill
- Landscape

- Military
- Music
- Parks
- Police
    - DWI
- Prison
    - Juvenile
- School
    - LSU
    - Southern
    - High School
    - Elementary
- Sports
- Traffic
- Wildlife

Master Control

Master Control plays a significant role in the archival workflow. Quality checks are essential because the amount of material acquired by the LPB tape library makes close scrutiny of every production difficult.

Master Control also creates the video files that are encoded for web through the Phil3k software. This process simultaneously delivers the web encoded files to the server, which makes them available for online streaming, while also providing access to the archivist so that she can perform a second quality check and catalog the program.

Traffic Department

The Traffic department's records in the ProTrack database have high archival value as they list the NOLA code, the Air Dates, LTO tape "archive group" and XDCAM number of locally produced programs. The archivist references this information when cataloging content. This is often the first record created for a local program and therefore begins the "lifecycle" of documentation related to a program.

Transfer Engineer

The Transfer Engineer has recently been charged with running the watch folder program on files that have been copied off of the caption master XDCAM disk. Files processed by this program will then be staged to be written to LTO-6 tape, just as files processed in the Legacy Programs workflow have been. Given the additional files, the Transfer Engineer will also likely be writing to LTO-6 tape slightly more often.

Recommendation:
Given that the responsibilities for this position have increased and that the Transfer Engineer has other duties related to the production of new programs and DVDs, it is recommended that additional engineers take on some of the Transfer Engineer's responsibilities. The task of

copying caption master files off of “queued” XDCAMs and onto the LDMA computer, for example, could be taken on by multiple individuals since it is a straightforward and relatively effortless process.

Engineering IT

As the production process is now entirely digital, the maintenance of the tools used to create such material, and preserve it, is essential to the archiving process. Engineering IT maintains the code and other functions of the Phil3k which powers much of the automated encoding in the current LPB workflow. The Phil3k encodes web copies of monthly and weekly programs from their broadcast masters and delivers those files to the web server. As mentioned elsewhere in this document, LPB is currently searching for a replacement to the Phil3k, and maintaining and providing support for this new workflow will also be a part of Engineering IT’s responsibilities. Engineering IT is also responsible for maintaining the machines that power LPB’s digital preservation procedures, selecting and purchasing hardware and software for such procedures, and updating this software as necessary.

Web IT

The Web IT department’s primary responsibilities as they relate to the archiving and preservation of Born-Digital Programs revolve around the database and the LDMA website. The Web IT department maintains the database, regularly creating Microsoft SQL backups, and troubleshoots any issues with functionality or access. Web IT is also responsible for importing MediaInfo XML files into the archive database so that technical metadata describing essence tracks of the various instantiations of the program is displayed. Preservation of any material is pointless without access, and therefore the preservation actions and processes described in this report would be pointless without the Web IT department’s role in maintaining and updating the web access portal to the LPB Archive, LPB.org and the LDMA website. Web IT also performs brief quality control checks on the web encoded files before they are pushed to these sites.

Promotions

Promotions collects a great deal of information on LPB programs that can have archival value. The *Visions* publication, for instance, has been invaluable for determining airdates and obtaining other descriptive information on legacy programs. Promotions collects a large amount of information and documentation on contemporary programs that can be referenced for cataloging material and streamline re-use. The archive database currently allows users to upload documents that the Promotions department retains and repurposes, such as the embedded funding message, descriptions used for submission to awards, as well as DVD cover art and promotional stills. There is a clear need for greater collaboration between Archives and Promotions to utilize and organize this material, so that a plan can be put forward to make more of this content accessible.

Recommendation:

The lack of communication between the Promotions department and the Archive is emblematic of the siloed nature of departments and workflows at LPB. While both departments struggle to acquire sufficient information and description of materials from producers, they do not interact

with one another. Documents and images collected by the Promotions department are stored digitally in a shared folder that the Archive should have access to. Similarly, the materials created and used by the Archive, the database and the photo archive spreadsheet, could be of value to the Promotions department. While changing permissions to shared drives between departments is an easy first step, the real problem is not a technical one, but a human one. Increased communication between individuals in different departments should be incentivized. Given that the content that the Promotions department saves does not overlap with the content archived on the LDMA website, such as photos taken at the station over the years, perhaps Promotions and the Archive can collaborate on a blog post for the LDMA? Another option could be sending the PDFs that Promotions creates, collecting documents they have stored and scanned from a particular year, to the Archivist, to promote discussion about the year in question and what other material from the archive exists in LPB's collection.

Section 5.7: Evaluation and Updating

With the impending changes to the production workflow due to the replacement of the Phil3k, it would be wise to consider re-evaluating the preservation practices of the Born-Digital Programs workflow once a replacement has been implemented. Similarly, when the Scalar-i500 has been updated to read and write to LTO-6 tapes, the archival workflow should be re-considered. It is important to consider the ways in which the new encoder or the new format of LTO tapes could streamline the preservation process.

Also, if any of the recommendations in this document are adopted and those changes are made to the workflow, particularly archiving Caption Master video files on LTO-6 tape (as opposed to on XDCAM), these changes should be reviewed. Ensure that all locally produced material has been transferred to LTO-6 tape. If it has not been transferred, explore how different responsibilities or procedures could help ensure that this takes place.

Any future change to the captioning process could also potentially allow for LPB to collect higher quality files directly from the Avid. If the captions workflow changes, LPB should review the current workflow to determine if a higher quality file is ideal, and if so, how to deliver it to the archive in a way that supports the contextualization that automated metadata extraction allows.

Changes to the workflow notwithstanding, a more macro-focused discussion between stakeholders in the LPB Archive could help steer adjustments and improvements to the archiving workflow. Annually, the archivist, producers, promotions, engineering, and IT should discuss how the archive can do more for these stakeholders and how these stakeholders can contribute more to the archive.

Chapter 6: Documentaries

Section 6.1: Project/Purpose Statement

LPB's documentaries represent the culmination of significant amounts of footage, research, and resources, an investment with equally significant returns, often for long after the program originally airs. These documentaries are often shown during the station's pledge drives and made available on DVD to LPB's viewers. The raw footage can then be re-edited in LPB's weekly and monthly programs and licensed to other productions. Given this level of reuse, LPB seeks to preserve the documentaries that LPB produces, as well as the underlying elements that make up those documentaries, including sufficient production information and documentation of legal agreements to re-use and license this material in the future.

While LPB already makes great use of this aspect of its tape library, locating and identifying materials like field tapes, releases, scripts, and other documentation relies heavily on institutional knowledge. This underlying material is not uniformly organized, making it more difficult to utilize. Additionally, there is usually only one copy of underlying audiovisual material, like field tapes and graphics, which presents a preservation risk, for born digital material.

Shifting practices in an entirely digital production environment make tracking and delivering material complicated, with many elements of a program being produced by many different people, often through many different iterations (several versions of a "final" script, for instance).

The purpose of this section is to outline LPB's current policies and practices, which are designed to help mitigate this challenge.

Section 6.2: Preservation and Quality Control

LPB produced documentaries receive all of the preservation and quality control actions that a typical locally produced program would receive before and after it airs. The air date and other metadata describing the show is entered into ProTrack, the file is written to the Harmonic Omneon playout server and subsequently backed up to two LTO-4 tapes, and a caption master is created on XDCAM disk. Documentaries garner additional preservation actions given their high re-use value, so multiple versions of the program and additional documentation are collected as well.

Yet, documentaries are currently submitted to the tape library informally. There are no specific delivery requirements. There are, however, some commonalities in the materials the library receives from producers.

Completed Documentaries

Completed documentaries are most often submitted to the tape library by the producer. Each different version of the documentary, such as split track, promo, and pledge versions, are submitted as well. These alternate versions are valuable for re-purposing and licensing.

Raw Footage

The raw footage shot during the production is just as valuable from a re-use and licensing perspective. Often, several XDCAM disks with raw footage are submitted to the archive in a box. These XDCAM disks are somewhat analogous to field tapes from a production, but they are not always the original field tapes. Instead, footage is exported from the Avid project onto XDCAM disks. This process consolidates the footage shot on different cameras and formats onto a single storage media. Descriptions of the disks' contents are provided by the producer and those descriptions are also added to the library database. The level of description of raw footage varies greatly from producer to producer. Some documentaries have each shot thoroughly described, with an accompanying thumbnail of the shot, delivered on printouts in a binder. One could then find a shot in the binder, and then using the file name, find the shot on the corresponding XDCAM. Other documentaries simply have a list of very brief descriptions, usually two or three words, written directly on the XDCAM disk label.

Documentation

Additionally, scripts, transcripts, agreements, grant proposals, and other forms of documentation are submitted to the archive somewhat sporadically. This documentation is submitted on paper, often in binders. Consequently, these documents are not always scanned and uploaded to the database, which presents a preservation risk and limits the ease of re-use.

As the production of documentaries increasingly relies upon graphics and effects software, such as Photoshop, Adobe Illustrator and Adobe After Effects, the elements these software are used to produce are at times submitted to the tape library on a hard drive.

Recommendations:

While there are typically several versions of a completed documentary submitted to the tape library, sometimes only one copy of each version is submitted. Archival and audiovisual preservation best practices suggest that at least two copies of such material be stored on separate media. Ideally, a third copy should also be located in a separate location. This protects against failure of the storage media, as well as the threat of a disaster or large-scale loss of material.

Similarly, typically only one copy of field tapes and other underlying material is collected and submitted to the tape library. While storage is finite, additional copies of select field tapes from LPB documentaries could help reduce the risk of loss. Raw footage that is requested often, such as coverage of the BP Oil Spill in 2010, could be backed up to LTO tape at the station's discretion. Frequently used storage media, like hard drives or optical disks, have a greater likelihood of failure, so a method for determining selection of material to backup could stem from tracking the number of times content is requested or how often a particular disk is used.

Alternatively, the archivist at LPB has a good sense of what material is frequently requested and a selection of material to backup could be made at her discretion.

Archiving legal documentation from documentaries facilitates licensing the program to other productions and makes rights issues easier to resolve. Contracts, grant applications, and funding agreements can be referenced by producers to inform future productions. For example, Christina Melton recently referenced the grant application from *Turning the Tide* (2011) when drafting a new grant application.

A backlog of large amounts of material makes organization and preservation of content significantly more difficult. In the future, the complexities of selecting what material to preserve and how to organize it can be simplified by starting the process earlier. **Establishing formal selection criteria**, such as which elements are submitted to the tape library and in what form, will ensure that organization and preservation of such content will be more streamlined and straightforward. Uniform submission of material also makes retrieval and reuse of that material much easier and faster.

Moving toward a file-based delivery of this material will also simplify the submission process and make processes like backup and uploading documentation of the material less labor intensive. The majority of the content created as part of a documentary is born digital. One exception is signed releases and contracts, which should be scanned for record keeping purposes anyway. Since materials submitted to the archive are already in digital formats, delivering these files to the archive in their native format reduces the time and effort involved in compiling them. File-based delivery could also simplify identification of material and expedite the process of documenting links between materials since this information is inherent to the native form of the file. File names and embedded metadata articulate what a document is and when it was last edited; directory structures group like materials; and Avid editing timelines demonstrate when and how each asset is used in the completed program. Moreover, delivering project files from Avid, After Effects, Photoshop, and other projects allows LPB to export different versions of derivative files, which simplifies the process of creating new promotional graphics or DVD artwork and guards against the obsolescence of a particular derivative file format, or the rise in popularity of a different format. Therefore, submitting a documentary and its underlying material as digital files is less labor intensive, streamlines preservation processes, allows documentation to be uploaded to the library database faster, makes the context of a document within a program clearer, and allows for greater reuse.

Including storage media for the purpose of archiving the completed documentary into the program's budget will help avoid creating a backlog of unorganized or not backed-up material. Such a backlog forces LPB to prioritize the preservation of some material over other material. Purchasing storage media for a documentary up front could serve as a more formalized method of delivery of content and serve as a reminder to producers that a formal delivery method is required. A typical documentary and all of its associated content will likely fit on a 2 terabyte (TB) hard drive, a moderate expense at the time of writing this report, which will only go down in cost. It is recommended that LPB build the cost of 2 separate 2 TB hard drives, and an LTO6

tape into the budget of a documentary. At the conclusion of production, all material deemed appropriate for the archive could be moved on to both of the hard drives and backed-up on LTO-6 tape. This LTO-6 tape could then be stored off-site.

Additional processes and policies will take time, resources, effort, and oversight to implement. It is recommended that LPB staff carve out a specific and ample time to collect and organize material for submission to the archive. Administrators should oversee this process and confirm that it has been completed. Without clear communication and clearly articulated goals shared between producers, editors, engineers, promotions, and the archivist, more formalized submission of documentaries to the tape library is not possible.

Below are suggested submission criteria for documentaries. These criteria are tiered: Minimum Requirement, Moderate/Medium Requirement, and Ideal Submission. The tiered criteria are intended to accommodate different producer's level of documentation and organization, while still attempting to meet the tape library's needs. Preferred file formats are listed beside the various elements of the criteria.

Proposed Submission Criteria for Documentaries

- Minimum Requirement
    - Final Script - PDF
    - Underwriting Contracts - PDF
    - Third Party Contracts (writers/producers/composers)
    - Licensed Footage/Images/Music Agreements - PDF
        - Log of Licensed Footage - PDF
    - Talent Releases
    - All Masters - XDCAM
        - Pledge Break version
            - W/ Captions
        - Broadcast version
            - W/ Captions
        - Edit Master
        - Textless Master
    - Credits - PDF
    - Supers List - PDF
    - All B-Roll - XDCAM, labeled
    - Raw Interviews - XDCAM, labeled

- Moderate/Medium
    - DVD artwork - TIFF and original version
    - Shot Level Logs of B-Roll and Field Tapes
    - Transcripts to Interviews
    - All Still Images Used - TIFF
        - Log of images, including file name and source
    - Rights restrictions summary

        - List of any all possible restrictions due to copyright
    - Descriptions of program
        - PSIP
        - Short
        - Long
        - Abstract
    - Grant Application

- Ideal
    - Avid Project
        - All assets linked
    - Graphics Projects
        - After Effects, Adobe Illustrator, Photoshop, etc.
    - Audio Stems
        - Log of Cues
    - Contact List
        - Description of individuals on list (role, bio if available)
    - Location Permits
    - Interview List
    - Research Materials

Section 6.3: Format Migration - XDCAM

As pointed out in previous sections, LPB's production workflow is significantly dependent on XDCAMs. At some point in the future, the station will no longer be using this format, leaving the raw footage from recently produced documentaries locked on an obsolete format. While still years away, it is worth considering a framework for determining which content to migrate to other storage media when the time comes. A starting point could be determining a mechanism or event that should begin this planning process, such as the station no longer recording to XDCAM or XDCAM decks beginning to fail. While this event is not in the near future, it is a preservation risk that will ultimately become an issue.

Section 6.4: Preservation Metadata

Since local documentaries are broadcast on LPB, the same metadata collection processes and preservation actions outlined in the Born Digital Programs section of this document also apply to the broadcast versions of LPB-produced documentaries.

Additionally, MediaInfo files should be produced for the audio and video files submitted to the archive in a file-based format, as well as checksum manifests for any hard drives submitted to the tape library. These files can be created using drag and drop .bat files.

For documentation purposes, the scripts that are used in these .bat files are as follows:

- *MediaInfo_drag_and_drop.bat*
  This file will create a MediaInfo report of an audio or video file in a PBCore 2.0 compliant XML file named after the source file with a suffix of ".MediaInfo.xml". Simply drag and drop a video file over the .bat file and the computer will run this script through the command line:

  ```
  for %%F in ('%1') do mediainfo --output=PBCore2 %1 > %%~nxF.MediaInfo.xml
  ```

- *Recursive_PBCore2_MediaInfo.bat*
  To create MediaInfo files for all video files with a .mp4, .mov, .mxf, or .mts extension in a particular folder or on a hard drive, use this recursive batch file. Due to the nature of this recursive file, the MediaInfo XML reports will be created in the same directory/directories as the video files themselves. Drag and drop the highest level directory of the drive from Windows Explorer over the .bat file and the computer will run the following script through the command line:

  ```
  for /r %%A in ("*.mp4", "*.mov", "*.mxf", "*.mts") do (mediainfo --
  output=PBCore2 "%%A" > "%%~nxA.MediaInfo.xml")
  ```

- *Make_checksum_manifest.bat*
  This file will create a md5 checksum of all files in a particular directory or device and aggregate those checksums into a single text file that will list all of the checksums and filenames. To use the script, drag the highest level directory of the volume you want checksum-ed over the .bat file. A text box next to your cursor should say "+ Open with Md5_recursive_drag_and_drop.bat". Drop the directory over the .bat file and it will open a command prompt window where the command in the script, and the current file the script is processing, will be displayed. A time remaining for each file that is being checksum-ed will show up, but not the cumulative time remaining.

  For example, if you wanted to create a checksum manifest for a hard drive, open Windows Explorer, navigate to where you can find the whole drive represented, and drag and drop the drive over the .bat file. Depending on how much content is on the drive, the process could take several hours:

  ```
  for /r %%A in ("*") do md5deep64 -b -e "%%A" >>
  "C:\Users\lbourgeois\Desktop\checksum_manifest.txt"
  sort "C:\Users\lbourgeois\Desktop\checksum_manifest.txt" /O
  "C:\Users\lbourgeois\Desktop\checksum_manifest_sorted.txt"
  ```

Make sure to change the filename of the "*checksum_manifest_sorted.txt"* to include the name of the drive, or the name of the associated production. Then, be sure to delete the checksum

manifest file. If it is not deleted, new checksums will simply be added to the list, as opposed to rewriting the file.

As more hard drives are submitted to the tape library, managing the data and the contents of those drives will become increasingly complex. Any file-based material submitted to the tape library should be submitted on two separate storage devices. If the material is not submitted in this way, a copy of the data should be moved onto a separate storage device.

If LPB is purchasing drives for the tape library, these drives should be selected for their longevity and reliability. Solid State Drives (SSD) are, at this time not recommended for long term storage. Currently, it is possible for SSD to slowly lose information when left on the shelf, although the technology is advancing at such a rate that date loss or “leak” of electrical charge on SSD could be a minor concern in the near future. When evaluating which hard drives to purchase for long term storage, confirm which company manufactured the hard drive and not the enclosure, which can sometimes be a different company. The data storage service Backblaze releases statistics on hard drive failure rates from the company's servers every fiscal quarter. This can be a helpful guide to which recently manufactured hard drives are unreliable. The last quarter of 2016 can currently be found at this URL: https://www.backblaze.com/blog/hard-drive-benchmark-stats-2016/

The checksum manifests will be helpful because they can serve a dual function as an inventory of the hard drives and a way of confirming that no data has been lost when duplicating a drive or otherwise copying media off of it (see Section 4.5 for checksum verification procedure). When consolidating material from one drive onto a drive that already has existing data, move the files from the hard drive under a single “parent” directory. The recursive md5 script can then run from this “parent” directory and create a checksum manifest that should match the one created on the original drive. The checksum manifests can be compared using the FC command (as described in Section 4.5).

Even though an informal record of these preservation actions (consolidation of data on drives or creating checksum manifests) will be created automatically in the form of a “date created” timestamp on the checksum manifest, a more formal record tracking when files were copied from a particular drive and the extent to which data is backed up, would be ideal.

Physical labels on drives that name the drive, and the location of a back-up of the data on the drive could be a helpful first step. For example, a drive related to the recent documentary *Deeply Rooted* could be named “LDROO-HD-1” and have a label on the hard drive’s box saying “Backup stored on LDROO-HD-2”. Additionally, a shorthand version of what is on the drive, such as a list of directories or a bullet point list of the types of material stored on the drive could also be helpful.

Outside of labeling, a spreadsheet tracking when checksum manifests were created for a particular drive and when drives were backed up or consolidated onto other drives could be a good way of tracking preservation actions. Also, while the checksum manifest does serve as an

inventory of files, the filenames are sorted alpha-numerically by checksum and not by any logical organization. Creating a separate inventory of the files on the drive would be ideal. These inventories - the “dir” output from a directory - could be stored as text files. Then, the text file’s name could be listed in the spreadsheet along with the other preservation actions performed on the drive.

Section 6.5: Roles and Responsibilities

Producers:

- Deliver every completed version of the documentary to the tape library within a timely manner
- Submit the raw footage from a documentary to the tape library after the completion of the project. This footage will be described at the shot level to the best of the producer’s ability.
- Deliver any grant applications associated with the project (whether they were awarded or not)
- Deliver scripts, supers lists, interview lists, and research documents associated with the project
- Deliver releases, contracts, permits, agreements and any other legal documentation to the archivist
- Deliver any still image files associated with the project, whether these are production stills or acquired images used in the program
- Address any questions the archivist has on the material to clarify final drafts and contextualize associated media

Promotions

- Collect and track all material used to promote a documentary production, including submissions to awards
- Collect and scan clippings mentioning LPB’s documentaries

Graphics

- Deliver Adobe After Effects, Photoshop, and Illustrator project files (if applicable)
- Deliver Logos of sponsors
- Deliver DVD artwork

Editor

- Export Narration, especially if foreign language narrations exist
- Export any acquired or original music
- Deliver Avid project file

Executive Producer

- Collect and track any approved legal documents (agreements, contracts, grants proposals, etc.)

Archivist

- Review material submitted to the tape library
- Catalog documentary in the database
- Upload accompanying documentation (scripts, contracts, releases, etc.) to the database
- Label any unlabeled material
- Perform preservation actions on hard drives submitted to the archive

Section 6.6: Evaluation and Updating

Given that documentaries at LPB are not produced with the same frequency and regularity as the other “content types” discussed in detail in this document, evaluation of the archiving process for documentaries could also be handled on more of a case-by-case basis. For instance, the producer of a documentary could have a small meeting with the archivist and executive producer before submitting a new documentary to the archive. This meeting could focus on how previous documentaries this producer has made have been archived and what could be changed or improved from this process. Alternatively, an ideal submission of a documentary could be held up as a template and the meeting could focus on how the current production might emulate this example. Regardless, planning for archival submission of the documentary and communication between the producer and the archivist is essential to improving the quality and amount of material submitted with a documentary.

Chapter 7: Disaster Planning

Because of LPB's role as an information provider during emergencies, the station has robust procedures in place to prepare for and respond to a disaster. The emergency planning team has drafted a Business Continuity and Disaster Preparedness Plan, which divides responsibilities among five specialized teams:

1. Initial Response
2. Crisis Management
3. Emergency Management
4. Logistics
5. Web

LPB is committed to staying on the air to disperse critical information during a crisis, while keeping LPB employees safe. The Business Continuity and Disaster Preparedness Plan in conjunction with the LPB Storm Preparation Plan ensure this commitment. It is recommended that minimal additions to the previously stated plans be made, simply to safeguard against the archival collection being overlooked in the case of an emergency.

- Business Continuity and Disaster Preparedness Plan
    - The plan already includes a section for Records Back-up, which details how LPB's electronic records, such as payroll and accounting systems, will be protected in the event of a disaster. It is recommended that archival records and archival audiovisual materials be added to this section of the plan and those responsible for the storage and backup of this data be listed.
        - The database that organizes and describes LPB's content is stored on the library server. The maintenance and backup of this server is managed by the LPB IT team. A native Microsoft SQL backup of the database is created twice a month and stored on a cloud service. Additionally, an onsite backup is made to a NAS device and to LTO data tape. These onsite backups would not be recoverable in the event of a disaster.
        - Legacy Programs, or digitized audiovisual material from the LPB Archive, is stored on LTO tapes, both locally and at the transponder in Alexandria, Louisiana. These could be recovered in the event of a disaster. However, the "Media2" server, which stores the web encoded copies of all LPB material that is available online (and material that is not available online as well), is only backed up locally to a NAS device. In the event of a disaster that affected this storage device, all of this data would be lost.
    - The Business Continuity and Disaster Preparedness Plan also includes a list of vendors in the "Suppliers and Contractors" Section. Vendors that specialize in audiovisual salvage and consultation should be added to this list, in the event that the materials stored in the tape library or any of the valuable paper documents stored throughout the building are damaged.

        - Recommended vendors:
        - Lyrasis Disaster Assistance:
          Phone – (504) 300-9478
          Email – disaster@lyrasis.org
          Website – Disaster Assistance
          Can provided advice and consultation on salvage techniques and management of recovery actions.
        - BMS Cat
          [www.bmscat.com]
          303 Arthur Street
          Ft. Worth, TX 76107
          800-433-2940
          Fax: 817-332-6728
          E-mail: info@bmscat.com
          Drying of paper, film, photographs
          Recovery of microfilm and microfiche
          Recovery of magnetic and digital media
          Mold remediation of buildings
          Sewage remediation
          Desiccant and refrigerant dehumidification of buildings
          Drying methods for paper records:
          Vacuum freeze drying

- LPB Storm Preparation Plan
    - During the “Level 2” phase, plastic sheeting should be placed over all of the shelves in the tape library to protect the video tapes from water damage. The mobile shelving units should be closed (all moved together) and sheeting should be used to cover all of them with the goal that water cannot drip in between the units.
    - During the “Level 3” phase, Post Storm, the tape library should be inspected for damage. If any damage has occurred, contact the archivist, who will begin planning response and coordinating with vendors, if necessary.

Additionally, certain procedures and preparations can be made to reduce confusion and streamline response when archival materials are damaged or threatened by unexpected events, such as a natural disaster, a fire, or a ceiling leak. These procedures should be carried out under the supervision of the archivist, and would occur after non-essential staff returns to work.

- In the event that archival materials are significantly damaged, contact the following hotlines, which are intended to provide guidance and consultation:
    - American Institute for Conservation of Historic and Artistic Works Disaster Response & Recovery
        - Hotline: (202) 661-8068

        - Website: http://www.conservation-us.org/index.cfm?fuseaction=Page.viewPage&pageId=695
    - Northeast Document Conservation Center Disaster Assistance
        - Hotline: (855) 245-8303
    - Lyrasis Disaster Assistance:
        - Phone – (504) 300-9478
        - Email – disaster@lyrasis.org
        - Website – Disaster Assistance
- If audiovisual materials are exposed to water or other contaminants, such as soot, contact a vendor to have those materials treated. The previously listed consultants may have advice in selecting a vendor to perform this task. The Diocese of Baton Rouge Archives has previously contracted and recommends BMS Cat, located in Fort Worth, Texas.
    - BMS Cat
      [www.bmscat.com]
      303 Arthur Street
      Ft. Worth, TX 76107
      800-433-2940
      Fax: 817-332-6728
      E-mail: info@bmscat.com
- Establish an inventory and priorities list for any damaged material. A few guidelines for determining priorities are listed below:
    - Prioritize material that has not yet been digitized.
    - Prioritize edited, complete material over ancillary footage or field tapes.
    - Prioritize analog material over born digital material, as digital content is more likely to have been on LTO-4 tape.
    - In the tape library, prioritize audiovisual material over paper documentation. For example, if a box storing material related to a documentary is exposed to water, attempt to salvage the field tapes in the box before treating the binder containing scripts and releases, as those are potentially scanned or stored elsewhere, and the footage is likely not.
- Communicate with local partners, such as the Louisiana State Archives. Local archives and libraries may have more resources and expertise in handling paper conservation or other salvaging procedures, and may be able to provide a helping hand or moral support.
- A collection of resources on the treatment and salvage of audiovisual and digital materials can be found here:
    - AVPS Disaster Response Information & Assistance
      https://www.avpreserve.com/blog/disaster-response-information-assistance/
- In the case of water damage either from natural disasters or from leaks, damp carpet should be dried as soon as possible in order to guard against mold, which can destroy magnetic media.
- Similarly, a leaking water pipe in the ceiling above one of the shelves in the tape library has been a persistent issue. There has not been a leak in some time, but to be safe the

valuable storage space is not currently being used as a precaution. Additional treatment should be explored if necessary to allow materials to occupy this space in the future.

- If archival materials are damaged the Society of American Archivists (SAA) and the Society of Southwest Archives (SSA) offer funds to aid in disaster recovery.
    - Download the application for the SSA grant from the link below: http://www2.archivists.org/news/2008/national-disaster-recovery-fund-for-archives

Chapter 8: Summary of Recommendations

Short Term Recommendations

- **Make Backup Copies of LTO-6 Tapes Stored at LPB**
  It is considered best practices in the field of digital preservation to have two copies of material on separate hardware, and a third copy in a geographically disparate location. LPB is currently one copy short, with one LTO tape stored at the station in Baton Rouge, and the other at a transponder in Alexandria.

  The LTO-6 tapes in the LPB tape library should be duplicated. This can be done manually, but will be time consuming, or through the use of a LTO tape duplicator (See section 4.6 for procedure).

- **Create Preservation Masters as Uncompressed or Lossless Files**
  It is recommended that LPB use uncompressed or lossless video and audio codecs when migrating analog material to digital formats. By replacing the XDCAM encoder with an Analog-to-Digital converter, and writing newly digitized video files directly to the LDMA computer, LPB can at once reduce the risk of file corruption and more easily create standardized preservation masters that are in keeping with archival best practices. The recommended preservation master file format is an FFV1 encoded .mov file. See Section 4.2 for a proposed new workflow for creating digital video files from analog content.

- **Require File-based Submission of Born-Digital Programs**
  Moving to a file-based workflow would allow LPB to perform archival processes on Born-Digital Programs, which the current workflow prohibits. Collecting checksums, MediaInfo reports, and MediaConch reports requires a digital file. The highest quality captioned version of Born-Digital Programs that LPB currently creates is written to XDCAM when the program is live captioned by LNS.

  This file can be moved off of the XDCAM disk and onto the LDMA computer in much the same way that preservation masters in the Legacy Programs workflow are created today. This would ensure that LPB could collect technical and preservation metadata from Born-Digital Programs and it safeguards against the risks associated with XDCAM (see Section 5.2 and Section 5.4 for more information).

- **Implement and Improve the Watch Folder Program**
  Engineering IT has recently designed and created a “watch folder” program that will automatically perform archival processes on preservation master files. The watch folder program can perform a series of actions on video files that are placed in a particular

directory. The program “watches” that directory, and when prompted, will perform automated tasks on the files stored there.
The initial implementation of the watch folder program will include the creation of metadata files, “packaging” of these metadata files with their corresponding video files, and verifying the package to ensure these processes were completed successfully (see Sections 4.3-4.5 for more on automated metadata creation and extraction).

There is potential for the watch folder program to have increased functionality, providing additional changes to LPB’s archival workflows. If LPB adopts an uncompressed or losslessly encoded preservation master file format, than the watch folder program could automate transcoding processes (this is described in detail in Section 4.2). Similarly, if LPB chooses to move to a file-based submission of Born-Digital Programs, the watch folder program could be modified to perform the same archival practices on Born-Digital Programs as it will on Legacy Programs (see Section 5.2 for more information).
The watch folder program creating and packaging all material in a uniform manner for archival submission through automated processes is ideal, and would increase the reliability of archival processes while streamlining the workflow.

- **Establish Formal Policies for the Uniform Submission of a Program’s Documentation to the Archive**
  The ability to re-purpose and provide access to the audiovisual material that LPB preserves is dependent on the ability to accurately identify rights restrictions now and in the future. To this end, any releases and contracts that impact the rights of a particular program in the LPB Archive should be submitted to the Archive.

  Efforts to motivate producers to promptly submit such documentation have been ongoing, and with mixed results. Formal and regular prompting of producers to submit documentation could aid in this effort. One of LPB’s several regularly held meetings, such as the weekly production meeting or the department head meeting could offer an opportunity to do so (see Section 3.1 and Section 5.5 for more information).

- **Migrate “Archived” LTO-4 Tapes to LTO-6**
  Engineering is already exploring LTO format migration solutions through Quantum, the vendor that produces the Scalar robot (with whom LPB holds a service contract). This process will involve the vendor sending out a technician to install LTO-6 drives in the current machine and helping to configure the migration.

  When evaluating the vendor’s proposed process for migrating from LTO-4 to LTO-6, LPB should verify that the migration will include thorough checks for fixity and completeness. There must be a way to demonstrate that all material that was stored on LTO-4 was successfully moved to LTO-6, and that no data was lost in the process (see Section 5.3 for more information).

- **Capture All Content from Analog Material**
  Any information on an analog tape from the tape library should be considered valuable, be it bars and tone, titles, or slates. Any form of source head information from the analog tape should be included on the resulting digital video file. The LDMA website will jump to the content through In and Out points set in the database, so there's no need to trim (see Section 4.2 for more information).

- **Document Technical Provenance of Digital Files**
  In order to describe the provenance of archived files, LPB could include a document that describes signal flow and creation of video files on each tape. This would include a list of devices involved, as well as the settings the Transfer Engineer has configured in the AJA control panel (Sample version in Section 4.8).

- **Collect Three Preservation Masters of LPB Produced Documentaries**
  It is recommended that LPB select a final version of a documentary for preservation, a copy which lends itself to re-purposing such as a split-track master, and collect three copies of this work, with one stored in a separate location (see Section 6.2 for more information).

- **Establish Formal Selection Criteria for Documentaries**
  Establishing formal selection criteria - which elements are submitted to the tape library, in what form - will ensure that organization and preservation of such content will be more streamlined and straightforward (see Section 6.2 for proposed Submission Criteria for Documentaries).

Medium Term Recommendations

- **Update LDMA Website to Allow for Sorting by Fields, Browsing by Keyword, and Other Needs Mentioned in the IMLS-Funded Focus Group**
  The focus groups performed as part of the IMLS funded Louisiana Digital Media Archive Planning Project provided valuable insight from stakeholders in the LDMA website. In particular, educators noted the need to be able to browse by date, by people of interest, and grade level. These needs, as well as other internal needs for the library database (such as adding certain fields), can be met by contracting a programmer to perform these specific tasks.

  The key need expressed by educators was not technical or programmatic, however. Many educators requested lesson plans that were based on material available through the LDMA. It is recommended that LPB consider creating lesson plans based on the LDMA through collaboration with an educator or student studying education (see Section 3.5 for more information).

- **Survey LDMA Users**
  LPB can engage with the users of the Louisiana Digital Media Archive to better

understand how the resource is currently being used. It is recommended that the LDMA website offer an optional survey. The survey should ask current users, most importantly, if they found what they were looking for. The survey should also ask what material they were looking for (perhaps by subject or topic) as well as asking their opinion on how the resource could be improved (see Section 3.5 for more information).

- **"Tag" Potentially Re-usable B-roll in Avid**
  While "turn around" times on weekly and monthly programs are short, minimum description of shots in an Avid bin will go a long way to promote re-use of LPB's b-roll and other footage. There has been a shortage of available b-roll produced in-house recently. HD footage of common topics such as education, prison, and healthcare, should be tagged and set aside for reuse. Similarly, b-roll of regional locales must be tagged in order to be discoverable. (See Section 5.6 for a list of example keywords.)

- **Verify LTO backups of the Born-Digital Programs "Local Group"**
  Moving forward, verification that backup LTO tapes produced as a part of the born-digital programs workflow are identical - a bit-for-bit copy of the original tape - should be added to the Master Control engineer's responsibilities (see Section 5.3 for more information).

- **Require File-based Delivery of Documentaries**
  Submitting a documentary and it's underlying material as digital files is less labor intensive, streamlines preservation processes, allows documentation to be uploaded to the library database easier, makes the context of a document within a program clearer, and allows for greater reuse.

  It is recommended that LPB build the cost of two separate 2 TB hard drives, and an LTO6 tape into the budget of a documentary. At the conclusion of production, all material deemed appropriate for the archive could be moved on to both of the hard drives, and backed-up on LTO-6 tape. This LTO-6 tape could then be stored off-site (see Section 6.2 for more information).

- **Create Backups of Select Documentary Raw Footage**
  Additional copies of select field tapes from LPB documentaries could help reduce the risk of loss. Raw footage that is requested often, such as coverage of the BP Oil Spill in 2010, could be backed up to LTO tape at the station's discretion (see Section 6.2 for more information).

- **Invest in Scalable, Medium Term File-based Digital Storage**
  Having file-based copies of archival material on a server or other network attached digital storage device would allow for more archival processes to be performed through automation. The necessary delay in retrieving information from LTO tape is a disincentive to using archival footage. The additional copy that file-based storage would provide also protects material from being lost, especially before it has been written to LTO tape.

Additional networked drives could have many benefits beyond the archive**.** A recent production meeting on repurposing b-roll from weekly and monthly LPB produced programs identified a need for a “near-line” storage device that could store high resolution clips with high reuse value (footage of commonly discussed local areas, or frequently mentioned subjects). Similarly, the engineering department has been discussing creating a digital “staging area” for content that is currently only written to LTO-4 tape. This repository would act as an “online” equivalent of the LTO-4 tape, and would allow Master Control to pull previously aired material without having to add wear and tear on LTO tapes. (See Section 5.4 for more information)

- **Update the Business Continuity and Disaster Preparedness Plan**
  It is recommended that archival records and archival audiovisual materials be added to the plan and those responsible for the storage and backup of this data be listed.
  The Business Continuity and Disaster Preparedness Plan also includes a list of vendors in the “Suppliers and Contractors” Section. Vendors that specialize in audiovisual salvage and consultation should be added to this list (see Chapter 7 for more information).

- **Update the LPB Storm Preparation Plan**
  During the “Level 2” phase, plastic sheeting should be placed over all of the shelves in the tape library to protect the video tapes from water damage. The mobile shelving units should be closed (all moved together) and sheeting should be used to cover all of them, with the goal that water cannot drip through in between the units.

  During the “Level 3” phase, Post Storm, the tape library should be inspected for damage. If any damage has occurred, contact the archivist, who will begin planning response and coordinating with vendors, if needed (see Chapter 7 for more information).

- **Review the following Grants for Funding for Future Preservation Projects:**
  Preservation Assistance Grants for Smaller Institutions
  “Preservation Assistance Grants help small and mid-sized institutions—such as libraries, museums, historical societies, archival repositories, cultural organizations, town and county records offices, and colleges and universities—improve their ability to preserve and care for their significant humanities collections. These may include special collections of books and journals, archives and manuscripts, prints and photographs, moving images, sound recordings, architectural and cartographic records, decorative and fine art objects, textiles, archaeological and ethnographic artifacts, furniture, historical objects, and digital materials.”
  https://www.neh.gov/grants/preservation/preservation-assistance-grants-smaller-institutions

  CLIR Hidden Collections Grant
  “The national competition, funded by The Andrew W. Mellon Foundation, supports digitizing collections of rare and unique content in collecting institutions. Grants of

between $50,000 and $250,000 for a single-institution project, or between $50,000 and $500,000 for a collaborative project, may be sought for projects beginning between January 1 and June 1, 2018."
https://www.clir.org/about/news/pressrelease/dighc-apply

Long Term Recommendations

- **Plan for Migration from LTO-6 to LTO-8**
  It is recommended that LPB follow the release of LTO-8 and plan for a migration accordingly. The price of LTO-8 tapes will likely drop significantly upon the release of LTO-9, which could serve as a mechanism to trigger a migration.

  It is recommended that both Legacy Programs and Born-Digital Programs be migrated to LTO-8 simultaneously. While perhaps painful, given the migration to LTO-6 will have occurred relatively recently, the benefits may outweigh the initial cost.
  Having all content on the same format will mitigate risk due to a higher level of institutional investment in a single format (see Section 5.3 for more information).

- **Plan for the Obsolescence of XDCAM**
  LPB should begin preparing for this transition as soon as possible by exploring methodologies to mimic popular capabilities of XDCAMs, such as the generation of lowres proxies, across formats.

  Newer formats are likely to be less robust than XDCAM disks, meaning they will likely be smaller (and therefore more difficult to label and easier to misplace), assume a high level of reuse (meaning they will store more data and be more expensive), and store data for less time (assuming these formats use solid state technology as opposed to optical encoding). With this in mind, the road ahead for storage media will likely mean that eventually LPB will not be able to rely on "field tapes" as storage media. From this perspective, investment in a greater amount of network attached data storage is inevitable.

  Also, while still years away, it is worth considering a framework for determining which content to migrate to other storage media, when the time comes. A starting point could certainly be determining a mechanism or event that should begin this planning process, such as the station no longer recording to XDCAM, or XDCAM decks beginning to fail. Again, while this event is certainly not in the near future, it is a preservation risk that will ultimately become an issue (see Section 5.4 and Section 6.3 for more information).

- **Incentivize Increased Communication and Collaboration Across Departments**
  The lack of communication between the promotions department and the archive is emblematic of the siloed nature of departments and workflows at LPB. While both departments struggle to acquire sufficient information and description of materials from producers, they do not interact with one another. Documents and images collected by

the promotions department are stored digitally in a shared folder that the archive ought to have access to. Similarly, the materials created and used by the archive, the database and the photo archive spreadsheet, could be of value to the promotions department. While changing permissions to shared drives between departments is an easy first step, the real problem is not a technical one but a human one. Increased communication between individuals in different departments must be incentivized (see Section 5.6 for more information).

- **Prioritize Archival Processes**
  A theme that runs throughout review of previous archive projects and grant narratives is a desire to generate and collect more information on programs during the production process or shortly after completion. The Program Profile on the library database is an example of this issue, while the file naming conventions mentioned in the Archive System Plan for Louisiana Public Broadcasting from 2008 is another. Feedback from staff at all levels of LPB attribute the inability to complete these tasks to a lack of time, as the priority of releasing new material always comes first. This problem is systemic, and not easily solved. It is out of scope for a temporary employee, not as accustomed to the work culture and climate of the station, and not involved in the day-to-day operations of the station in the long-term, to solve this issue. That being said, a suggestion to address this ongoing issue is to carve out designated time and resources for archival activities by production staff. A day once a month, or a week following the completion of a production, when archival processes are the only priority for producers, editors, and other staff involved with a project. This time could be spent on logging clips, assembling releases and other legal documents relevant to a program's copyright, collecting elements from graphics and editors for submission to the tape library, discussions with the archivist to determine what material should be submitted (and what material should not be submitted), simply labeling field tapes, or any other tasks that are often set aside in favor of a different priority. When this time period occurs, who it would apply to, and how it would be enforced are complicated questions, but to leave them unanswered will result in the repetition of existing problems.