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QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	COLLECTION OF SCENE MONITORING PHOTOGRAPHIC FILM, VIDEOTAPE, AND DIGITAL IMAGES
TYPE	STANDARD OPERATING PROCEUDRE
NUMBER	4305
DATE	JANUARY 1994

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
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PROJECT MANAGER	James H. Wagner	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

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1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) outlines the quality assurance and quality control actions associated with the collection, processing, and handling of photographic and video monitoring data. This SOP serves as a guide to assure high quality data collection from automatic camera or video monitoring stations.

Documenting visibility or visual events and trends is an important aspect of evaluating existing or potential impairment in Class I and other visibility-sensitive areas. Photography is an efficient way to document these events and trends and is an effective method of communicating visual relationships to decision-makers and to the public. Self-contained, automatic camera monitoring systems or time-lapse video monitoring systems are easily installed and operated. Camera-based monitoring, referred to as scene monitoring, is an effective, economical component of any visibility monitoring program.

An automatic camera visibility monitoring station takes 35 mm slides or high-resolution digital images of a selected vista at user-selected times throughout the day. The station can also be outfitted with an SVHS time-lapse recorder to record the dynamics of visibility events. Day-to-day variations in visual air quality captured on 35 mm color film, SVHS videotape, or digital camera systems can be used to:

- Document how vistas appear under various visual air quality, meteorological, and seasonal conditions. Scene characteristics include observer visual range, scene contrast, color, texture, and clarity.
- Record the frequency that various visual air quality conditions occur (e.g., incidence of uniform haze, layered haze, or weather events).
- Provide a quality assurance reference for collocated measurements.
- Determine the visual sensitivity of individual areas or views to variations in ambient air quality.
- Identify areas of potential impairment.
- Estimate the optical properties of the atmosphere under certain conditions.
- Provide quality media for visually presenting program goals, objectives, and results to decision-makers and to the public.
- Provide support data for the computer image modeling of potential impairment.
- Support color and human perception research.

Slides, digital image files, and videotape, however, do not provide quantitative information about the cause of visibility impairment. Aerosol and optical properties of the atmosphere must be independently monitored where cause and effect relationships are required.

In addition to visibility monitoring, time-lapse video systems can be used for a variety of other purposes, including:

- Environmental monitoring such as wildlife, waterflow, and source monitoring.
- Security monitoring for remote industrial sites and storage depots.
- Construction monitoring for building sites or highway and bridge construction.
- Event monitoring for remote weather documentation or highway and airport conditions.
- Recreation monitoring for ski areas and river rafting.

The following technical instructions (TIs) provide detailed information regarding specific photographic film and digital image collection, processing, and handling procedures:

- TI 4305-4000 *Collection, Processing, and Handling of 35 mm Slide Film*
- TI 4305-4100 *Collection and Handling of Digital Images*

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall oversee all collection, processing, and handling procedures.

2.2 DATA COORDINATOR

The data coordinator shall:

- Supply the site operator with all necessary monitoring supplies.
- Verify that scheduled site visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all documentation completed by the site operator for completeness and accuracy, and file all documentation and correspondence in the site-specific notebooks and quality assurance database.
- Oversee film, videotape, and digital image storage media tracking.
- Review all film, videotape, and digital images for quantity and quality.
- Resolve problems reported by the site operator and data technician.
- Verify that all Master Log documentation is complete and accurate.

- Complete an Operational History Log for each videotape cassette.
- Determine collection and recovery statistics.
- Prepare all duplicate videotapes.

2.3 DATA TECHNICIAN

The data technician shall:

- Log receipt of all film rolls, videotapes, memory cards, and other storage media mailed to Air Resource Specialists, Inc. (ARS) from site operators.
- Ship all exposed film to the Kodalux laboratory for developing.
- Log all developed film returned from Kodalux processing.
- Complete Master Log documentation for each film roll, videotape cassette, memory card, or other storage media (e.g., CD, DVD, hard drive, thumb drive, etc.).
- Identify and chronologically label all 35 mm slides, videotapes, and digital images by site.
- Complete Visibility Monitoring Slide Logs.
- Report any noted documentation or data inconsistencies to the data coordinator.
- File all fully documented film products and videotapes.
- Distribute duplicate videotapes as specified to project participants.

2.4 SITE OPERATOR

The site operator shall:

- Report any noted inconsistencies upon site servicing and film, videotape, or storage media changing to the data coordinator.
- Complete a Visibility Monitoring Status/Assessment Sheet and label for each film roll or memory card.
- Complete a Time-Lapse Visibility Monitoring Status/Assessment Sheet and videotape label for each videotape cassette.
- Mail exposed film, videotape, full memory card, or other storage media and accompanying documentation to ARS.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 REQUIRED EQUIPMENT AND MATERIALS FOR 35 MM SLIDES

The following equipment and materials are used to collect, document, and validate 35 mm color slide film:

- Kodachrome 64 36-exposure color slide film
- Film canister labels
- Mailing envelopes
- Film processing mailers
- Automatic Camera Visibility Monitoring Status/Assessment Sheets
- Master Logs
- Visibility Monitoring Slide Logs
- Light table
- Hand-held viewing lens
- Alpha-numeric slide number stamps
- Polyethylene slide protector sheets
- Manila and hanging file folders
- 3-ring notebooks

3.2 REQUIRED EQUIPMENT AND MATERIALS FOR TIME-LAPSE VIDEOTAPE

The following equipment and materials are used to collect, document, and validate SVHS time-lapse videotape:

- SVHS videotape cassettes
- Videotape labels
- Mailing envelopes
- Time-Lapse Video Monitoring Status/Assessment Sheets
- Operational History Logs

- SVHS video cassette player
- Review monitor
- 3-ring notebooks

3.3 REQUIRED EQUIPMENT AND MATERIALS FOR DIGITAL IMAGES

The following equipment and materials are used to collect, document, and validate digital images collected from memory cards, CDs, DVDs, hard drives, other storage media, or Internet download:

- Memory cards, pouches, and pouch labels
- Mailing envelopes
- Visibility Monitoring Status/Assessment Sheets (RDCS systems only)
- Master Logs
- Personal computer (PC) with CD writer
- Memory card reader or adapter (PCMCIA Compact Flash reader, adapter, or USB Flash Card reader)
- ARS' Air Quality Database
- 9-12-15 Extraction software
- Blank CDs and DVDs
- Manila folders
- Hanging folders
- File cabinet
- 3-ring binders

4.0 METHODS

This section includes the following two (2) subsections:

- 4.1 Scene Monitoring Station Configurations
- 4.2 Collection, Processing, and Handling of Scene Monitoring Photographic Film, Videotape, and Digital Images

4.1 SCENE MONITORING STATION CONFIGURATIONS

Scene monitoring station configurations are configured based on:

- Monitoring location and monitored scenic vista or view of interest.
- Frequency that various visual air quality conditions or monitoring interests occur.
- Complexity of diurnal variations and observed visibility events.
- Collocated air quality monitoring instrumentation.
- Site-specific monitoring objectives.
- Proximity to AC power if an AC SVHS time-lapse system or AC digital camera system is used.

An automatic 35 mm camera system or high-resolution digital camera system documents observed visual air quality at user-selected times throughout the day. Photographic slides or digital images often provide a quality assurance reference for collocated visibility measurements. Slides are also a quality media that can be easily replicated or digitized to support computer image modeling and perception research.

SVHS time-lapse recorders document the dynamics of ongoing air quality and meteorological related events or other events.

4.2 COLLECTION, PROCESSING, AND HANDLING OF SCENE MONITORING PHOTOGRAPHIC FILM, VIDEOTAPE, AND DIGITAL IMAGES

Major steps in the data collection, processing, and handling of scene monitoring data are described below. Specific step-by-step procedures for each type of camera or video system are detailed in the technical instructions listed in Section 1.0.

4.2.1 Photographic Media Collection

All 35 mm (from a single emulsion number) is purchased from a Kodak direct distributor to cover two (2) consecutive monitoring seasons. High quality videotapes are purchased in bulk quantities. Film and videotapes are shipped to sites with specific handling and storage instructions, and supplemental monitoring supplies.

The site operator completes a film canister/cartridge label or videotape label and attaches it to each new film roll or videotape upon loading into the camera or time-lapse recorder. When the operator returns to remove the film or videotape, he or she completes the information on the label, places the film or videotape in a padded envelope, and mails it along with a Visibility (or Video) Monitoring Status/Assessment Sheet to ARS.

When servicing a digital camera site, the operator loads a formatted memory card into the camera, if so equipped. Camera scripting programs record the date and time that images are taken. The operator also completes a memory card pouch label and attaches it to the memory card pouch. The labeled pouch is shipped to ARS via FedEx, along with a completed Visibility Monitoring Status/Assessment Sheet. With systems having no memory card, the images and related files are stored directly onto the image computer's hard drive.

4.2.2 Photographic Media Processing

4.2.2.1 Film Processing

Processing procedures for 35 mm film are nearly identical. Film that arrives from the field is immediately recorded on a site-specific Master Log according to the roll number and the time period the film documents. The following items are maintained on each Master Log:

- Site name
- Site operator
- Roll numbers
- Mailer numbers
- Emulsion number
- Dates when film rolls were sent to Kodalux processing and dates returned
- Beginning and ending dates and times of the photographs contained on the film roll
- Slide numbers
- Recovery statistics
- Correspondence
- Problem history
- Equipment changes
- Supplies mailed

The Visibility Monitoring Status/Assessment Sheet is thoroughly reviewed to verify proper camera operations and note any weather anomalies or requested operational supplies. Any discrepancies are documented by site and roll number on the Master Log and corrective action is initiated. Any requested monitoring supplies or equipment components are shipped.

All film is sent by courier to the Kodak processing laboratory in Dallas. Roll and film processing mailer numbers are documented on the Master Log. All shipments are tracked and traced if necessary by mailer number.

4.2.2.2 Videotape Processing

SVHS videotape cassettes that arrive from the field are immediately recorded on an Operational History Log. The following items are maintained on each log:

- Site name
- Site operator
- Videotape number
- Date when the videotapes were received at ARS
- Comments or correspondence
- Monitoring period dates documented on each videotape
- Recovery statistics
- Videotape review status
- Delivery status of duplicate videotapes made

4.2.2.3 Digital Image Processing

No processing is required for digital images. Images (in JPEG format) are taken directly off the memory card, or from the image computer hard drive to CD, DVD, another hard drive, other storage media, or transferred via Internet download for viewing.

4.2.3 Photographic Media Handling

Receipt of the developed 35 mm film from Kodak is recorded on the site Master Log. Film rolls are stored chronologically in a pollutant-free, controlled environment.

4.2.3.1 Handling of 35 mm Slide Film

Extraneous 35 mm slides (if any) are removed and documentation and target photographs are arranged in polyethylene protector sheets by date and time. Following verification of slide arrangement, each slide is numbered sequentially and stamped with a four-letter site code. The slide set is placed in a manila folder along with a completed Visibility Monitoring Slide Log and the associated Visibility Monitoring Status/Assessment Sheet.

Slides are reviewed to verify that the vista alignment is correct, the databack date and time is recorded on the film, the slides are arranged in proper order, and that no exposure inconsistencies exist. Any discrepancies are documented by site and roll number on the Master Log and corrective action is initiated.

When all slides are collected for the monitoring season, final collection and recovery statistics are determined. Final Master Logs are stored in 3-ring notebooks.

4.2.3.2 Handling of SVHS Time-Lapse Videotapes

Videotape cassettes are reviewed for camera and system component operation, exposure quality, frame alignment and focus, timing, the detection of unusual visual events or anomalies, and dirty or obscured shelter windows. Any problems or discrepancies observed are documented by site and videotape number on the Operational History Log and corrective action is initiated.

Labeled videotape cassettes are placed chronologically in site-specific storage boxes within storage cabinets. Final collection statistics are determined and recorded on the Operational History Logs. All supporting documentation including the Operational History Logs, Time-Lapse Video Monitoring Status/Assessment Sheets, and other notes or important observations are kept in 3-ring notebooks by site, and filed alongside the videotapes.

4.2.3.3 Handling of Digital Images

Digital images collected on memory cards, CDs, DVDs, hard drives, other storage media, or transferred via Internet download are copied to a personal computer, written to a CD for archive, and placed in the Air Quality Database. All images are reviewed for correct date and time sequence, proper exposure, alignment, and zoom angle. Any discrepancies are documented on the Master Log and corrective action is initiated.

When all images are collected for the monitoring season, final collection and recovery statistics are determined. Completed Master Logs, Visibility Monitoring Status/Assessment Sheets, thumbnail printout of images, and image parameter file are stored in 3-ring notebooks.

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PROJECT MANAGER	James H. Wagner	
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QA MANAGER	Gloria S. Mercer	
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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the collection, processing, and handling procedures for 35 mm color slide film. This TI is referenced in SOP 4305, *Collection of Scene Monitoring Photographs and Film (IMPROVE Protocol)*, specifically describes:

- Tracking and documenting 35 mm film rolls.
- Identifying and labeling 35 mm color slides.
- Validating 35 mm slide quantity and quality.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall oversee all collection, processing, and handling procedures.

2.2 DATA COORDINATOR

The data coordinator shall:

- Supply the site operator with film and all necessary monitoring supplies.
- Verify that scheduled site visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all film documentation completed by the site operator for completeness and accuracy, and file all documentation and correspondence in the site-specific quality assurance database.
- Oversee film tracking.
- Review all film for quantity and quality.
- Resolve problems reported by the site operator and data technician.
- Verify that all Master Log documentation is complete and accurate.
- Determine collection and recovery statistics.

2.3 DATA TECHNICIAN

The data technician shall:

- Log all film rolls mailed to Air Resource Specialists, Inc. (ARS) from site operators.
- Ship all exposed film to the Kodalux laboratory for developing.
- Log all developed film returned from Kodalux processing.

- Complete Master Log documentation for each film roll.
- Identify and chronologically label all slides by site.
- Complete Visibility Monitoring Slide Logs.
- Report any noted documentation or data inconsistencies to the data coordinator.
- File all slides and supporting documentation.

2.4 SITE OPERATOR

The site operator shall:

- Report any noted inconsistencies upon site servicing and film changing to the data coordinator.
- Complete a Visibility Monitoring Status/Assessment Sheet and film canister label for each film roll.
- Mail exposed film rolls and accompanying documentation to ARS.

3.0 REQUIRED EQUIPMENT AND MATERIALS

The following equipment and materials are used to collect, document, and validate 35 mm color slide film:

- Kodachrome 64 36-exposure color slide film rolls
- Film canister labels
- Mailing envelopes
- Film processing mailers
- Visibility Monitoring Status/Assessment Sheets
- Master Logs
- Visibility Monitoring Slide Logs
- Light table
- Hand-held lens
- Alpha-numeric slide number stamps
- Polyethylene slide protector sheets
- Manila and hanging file folders
- 3-ring notebooks

4.0 METHODS

The major steps in the data collection, processing, handling, analysis, and archiving of 35 mm color slide film are presented in Figure 4-1. The specific steps described in this and related TIs are highlighted in this figure. Table 4-1 summarizes the collection, processing, and handling steps described in the following subsections of this TI.

This section includes the following three (3) major subsections:

- 4.1 Film Collection Procedures
- 4.2 Film Processing Procedures
- 4.3 Film Handling Procedures

4.1 FILM COLLECTION PROCEDURES

4.1.1 Film Purchase and Distribution

ARS purchases Kodachrome ASA 64, 36-exposure color slide film (from a single emulsion number) from a direct Kodalux distributor. Enough film is purchased to cover two consecutive monitoring seasons. The data coordinator ships a six-month (two seasons) supply of film to each monitoring site in film storage boxes. Specific film handling and storage instructions are attached to each film storage box (see Figure 4-2). Mailing envelopes and associated photographic monitoring supplies are also provided.

4.1.2 Field Documentation

Collection procedures for 35 mm color slide film include site servicing visits to perform film changes at the required interval, and the mailing of exposed film rolls and accompanying documentation by the site operator to ARS. When servicing a site, the operator loads a film roll into the camera and takes a photograph of the photo documentation board on the first exposure of the roll. The board contains:

- Monitoring site identification
- Date
- Time
- Film roll number (numbers are consecutive)

Each camera is also equipped with a databack that records the date and time that the photograph was taken on the lower right corner of each slide.

The operator also completes a film canister label and attaches it to the film canister. An example film canister label is provided as Figure 4-3. When the film is removed upon the next site servicing visit, the operator completes the information on the canister label, places the film in a padded envelope, and mails it, along with the Visibility Monitoring Status/Assessment Sheet, to ARS via first class mail.

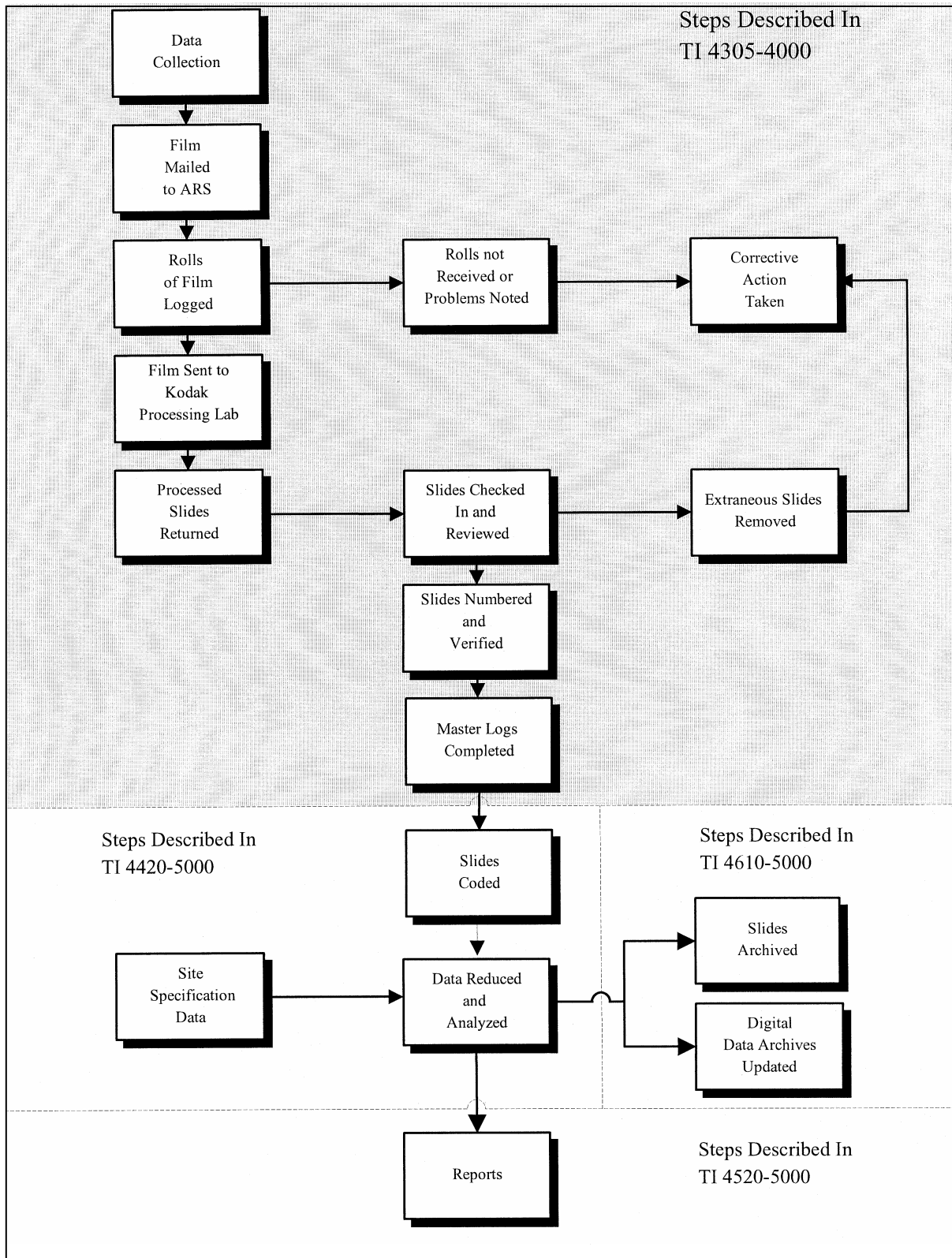


Figure 4-1. Major Steps in the Data Collection, Handling, Processing, Analysis, and Archiving of Photographic Data.

Table 4-1

Summary of Steps and Timing in the
Collection, Processing, and Handling of 35 mm Slide Film

Step	Time Path	Description
Data Collection	Overview	A batch of Kodachrome 64, 36-exposure color slide film is purchased at 6-month intervals. Operational supplies and film are distributed to the sites every 6 months, along with film handling and storage instructions. Automatic cameras are usually programmed to take photographs of a selected vista 3 times a day at 0900, 1200, and 1500 local time. The film is removed for processing every 11 days. (For this example, it is assumed that the photographic data is collected on Tuesday, 2/18/94, and this data complete a 36-exposure roll of film.)
Film Mailed to ARS	02/18/94	The operator documents all pertinent camera operations and meteorological conditions on a Visibility Monitoring Status/Assessment Sheet and completes the film canister label. The film and status/assessment sheet are mailed to ARS via first class mail.
Rolls of Film Logged	02/24/94	Film that arrives from the field is immediately recorded on a site-specific Master Log according to the roll number and the time period the film documents. Any film not received in a timely manner or discrepancies noted on the status/assessment sheet are documented by site and roll number on the Master Log and corrective action is initiated.
Film Sent to Kodak Processing Lab	02/25/94	Film is sent by courier to the Kodalux processing laboratory in Dallas.
Process Slides Returned	02/28/94	Receipt of the developed slides from Kodalux is recorded on the site Master Log.
Slides Checked-In and Reviewed	03/02/94	Extraneous slides (if any) are removed and documentation and target photographs are arranged in polyethylene sheets by date and time. Slides are reviewed to verify that the vista alignment is correct and that no equipment or exposure inconsistencies exist. Any discrepancies are documented by site and roll number on the Master Log and corrective action is initiated by the data coordinator.
Slides Numbered	03/02/94	Following verification of slide arrangement, each slide is numbered sequentially and stamped with the four-letter site code. A Visibility Monitoring Slide Log is completed with slide numbers and corresponding dates and times. The slide set (roll) and slide log are placed in a manila folder.
Slides Verified	03/05/94	Each set of slides and accompanying log is reviewed once more by the data coordinator. Preliminary data collection statistics and corrective actions taken (if any) are documented on the Master Log. The slide set is then filed according to site name and monitoring season.
Final Collection Statistics Prepared	05/01/94	Final Master Logs are prepared by the data coordinator at the completion of each season to summarize the data collected and thoroughly document data recovery and observed equipment operation discrepancies, as well as actions taken to resolve such discrepancies.

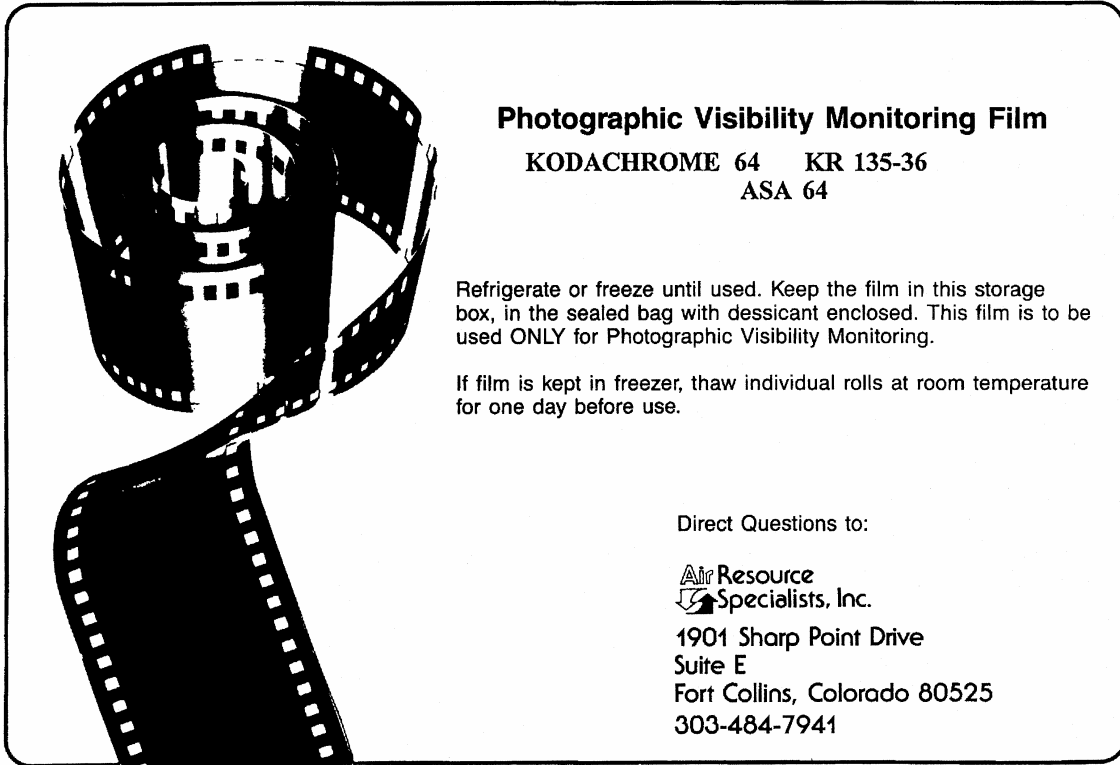


Figure 4-2. On-Site Film Handling and Storage Instructions Attached to the Film Storage Box.

LOC: _____	ROLL # _____
DATE ON: _____	TIME ON: _____
DATE OFF: _____	TIME OFF: _____
EMULSION #: _____	
EXPIRATION DATE: _____	

Figure 4-3. Example Film Canister Label.

An example Visibility Monitoring Status/Assessment Sheet is provided as Figure 4-4. Film should be sent immediately to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive Suite E
Fort Collins, CO 80525
Attention: Photographic Data Coordinator

Further details on site servicing procedures and site operator-related film collection procedures can be found in the camera-specific technical instruction for routine site operator maintenance of 35 mm automatic camera systems (TIs 4120-3100, 4120-3110, 4120-3120, 4120-3130, and 4120-3140).

4.2 FILM PROCESSING PROCEDURES

4.2.1 Master Log

Completion of the Master Log is essential to ensure quality film documentation. Information recorded on the Master Log is partially derived from site operator documentation; the remainder of the information is recorded for tracking purposes during film processing and film handling. An example Master Log is provided as Figure 4-5. The following information is entered on the Master Log:

- Season.
- Site name and abbreviation.
- Contact person (site operators).
- ROLL # - Consecutive, chronological film roll number by site.
- LOG - *Yes* if a status/assessment sheet was completed and accompanies the film roll, *no* if a status/assessment sheet was not sent with the film roll.
- SENT PROC - Date when the film was received at ARS from the site and sent to Kodalux for processing.
- MAIL # - Film processing mailer number for film tracking during processing and shipping.
- EMUL # - Film emulsion number as recorded on the film canister label.
- BACK PROC - Date when the film was received at ARS from Kodalux after being processed.
- SLIDE # - Beginning and ending slide numbers of the properly sequenced set for the monitoring period.
- # GOOD - The actual number of slides that are usable for qualitative analysis.

Location _____ Roll No. _____
 Operator _____

**AUTOMATIC CAMERA
 VISIBILITY MONITORING STATUS/ASSESSMENT SHEET**

FILM LOADED

Today's Date _____ Time _____

Yes No

- Batteries tested
- Documentation photograph taken
- Camera main switch (circle one)
 A(EOS) Auto (OM2S) Off (OM2N)
 On(137MA) (167MT) ON(PZ-20)
- Aperture F8.0
- ISO/ASA 64 (137MA ASA 100)
- All other camera settings correct
 (refer to 35 mm camera checklist)
- Lens focus on infinity
- Databack display correct
- Timer clocks and alarms verified
- Camera/timer cable secure
- Camera alignment correct
- Film advancing properly
- Enclosure door locked and
 door seal clamps tightened

FILM REMOVED

Today's Date _____ Time _____

Yes No

- Camera found in proper operation
- Camera alignment correct
- Film advanced as expected
 exposure count on _____
- Camera main switch (circle one)
 A(EOS) Auto (OM2S) Off (OM2N)
 On(137MA) (167MT) ON(PZ-20)
- Aperture F8.0
- ISO/ASA 64 (137MA ASA 100)
- All other camera settings correct
 (refer to 35 mm camera checklist)
- Camera/timer cable secure
- Timer found in proper condition
- Film rewind correctly
- Film canister properly labeled

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of this roll _____

Current % Cloud Cover _____ Temperature _____
 Now Max Min

COMMENTS/ACTION TAKEN _____

SUPPLIES NEEDED _____

Mail white copy and 35 mm film to:

**Air Resource
 Specialists, Inc.**
 1901 Sharp Point Drive, Suite E
 Fort Collins, CO 80525
 Phone: 970-484-7941
 Fax: 970-484-3423

Figure 4-4. Example Automatic Camera Visibility Monitoring Status/Assessment Sheet.

MASTER LOG

CONTACT PERSON

SITE NAME AND ABBREVIATION

ROLL #	LOG	SENT PROC	MAIL #	EMUL #	BACK PROC	SLIDE #	# GOOD	# REC'D	# POS	DATE LOG	TIME LOG	CORRESPONDENCE	PROBLEMS	EQUIPMENT CHANGE	SUPPLIES MAILED

Figure 4-5. Example Master Log.

- # REC - The actual number of slides taken, recorded after review and validation of the film.
- # POS - Number of slides possible on the film roll, noted by the on/off dates and times the site operator recorded on the status/assessment sheet.
- DATE LOG - The beginning and ending dates of the slides contained on the film roll, as noted by the site operator on the status/assessment sheet and verified by review of the slides.
- TIME LOG - The beginning and ending times of the slides contained on the film roll, as noted by the site operator on the status/assessment sheet and verified by the review of the slides.
- CORRESPONDENCE - Notation and description of correspondence or communication pertaining to each specific film roll.
- PROBLEMS - Notation and description of problems pertaining to each specific film roll.
- EQUIPMENT CHANGE - A notation of the type and date replacement changes or modifications were made at the site, if applicable.
- SUPPLIES MAILED - A notation of the type, volume, and date supplies were sent to the site, if applicable.

The data coordinator verifies that all Master Log documentation is complete and accurate. Master Logs and any accompanying documentation are chronologically stored in 3-ring notebooks by site.

4.2.2 Visibility Monitoring Status/Assessment Sheet Review

The Visibility Monitoring Status/Assessment Sheet is thoroughly reviewed by the ARS data technician and data coordinator to verify proper camera operations and note any weather anomalies or requested operational supplies. Any discrepancies are documented by site and roll number on the Master Log and corrective action is initiated. Any requested monitoring supplies or photographic components are shipped within 24 hours, provided sufficient backup equipment/supplies are available.

4.2.3 Film Processing

After each exposed film roll has been identified and recorded on the Master Log, it is placed in an individual 35 mm film processing mailer that has a specific identification number (also recorded on the site Master Log). Site abbreviation and film roll number are noted on the mailer for further identification. Film mailers are shipped via courier to the Kodak processing laboratory in Dallas twice a week.

The developed film is returned via courier to ARS in three to four days. If the film is not returned within seven days, ARS calls the courier to verify the arrival of the shipment, and a trace is made if any discrepancies in shipping/receiving dates are discovered.

4.3 FILM HANDLING PROCEDURES

4.3.1 Slide Check-In and Arrangement

Receipt of the developed slides is recorded on the site Master Log. All slides are visually reviewed by the data technician on a light table. Extraneous slides (if any) are removed, and documentation and target photographs are arranged in polyethylene protector sheets by date and time. Only slides that represent the standard date and time sequence of the selected vista or those taken purposely to document specific visibility events or site conditions are kept. The documentation board photograph is placed in upper left corner of the protector sheet at the beginning of each roll of film.

4.3.2 Slide Verification

Slides are further reviewed by the data technician and data coordinator to verify that:

- The vista alignment is correct.
- The number of slides corresponds to the data collection period noted on the film canister label.
- Databack date and time are recorded on the film.
- Slides are arranged in proper order.
- No exposure inconsistencies exist.
- The vista focus is correct.

All photographs are considered usable (good) for further qualitative analyses, except for:

- Supplemental visibility photographs.
- Out-of-alignment photographs (e.g., the target is not in the view).
- Extremely under- or overexposed photographs.
- Out-of-focus photographs; distinct features cannot be identified.
- Photographs taken through a fogged or icy shelter window.

Any discrepancies found are documented by site and roll number on the Master Log and corrective action is initiated by the data coordinator. (Refer to camera-specific emergency maintenance procedure TIs.) Any problems or interesting events observed on the slides are reviewed with the project manager. Qualitative review procedures are detailed in TI 4420-5000, *Qualitative Scene Coding and Data Reduction of 35 mm Color Slides*.

4.3.3 Slide Numbering and Filing

Following verification of slide arrangement, each slide is numbered sequentially and stamped with the four-letter site code by the data technician. A Visibility Monitoring Slide Log is also completed to provide a quick reference, hard copy record of the slide numbers, dates, and times captured on each roll of film (see Figure 4-6). Slide-specific comments can also be included on the log if appropriate. The slide set is placed in a manila folder along with the completed Visibility Monitoring Slide Log and the associated status/assessment sheet. The folder is labeled with the site abbreviation and roll number.

Each set of slides and accompanying log is reviewed once more by the data coordinator. After the review the folder is labeled with the slide numbers and corresponding dates. Each file is then chronologically stored in a hanging file folder by site and season. Seasons are defined as:

Winter	(December, January, and February)
Spring	(March, April, and May)
Summer	(June, July, and August)
Fall	(September, October, and November)

Refer to TI 4610-5000, *35 mm Photographic Slide Archives* for detailed archive procedures.

4.3.4 Final Collection and Data Recovery Statistics

Master Logs are completed and verified by the data coordinator at the end of each season to summarize the data collected at each site and to thoroughly document data recovery and observed equipment operation discrepancies, as well as actions taken to resolve such discrepancies. The completed Master Logs reflect final collection statistics for the period.

Data recovery statistics are compiled seasonally by the data coordinator. The primary data collection statistic calculated is:

$$\% \text{ Overall Data Recovery} = (\# \text{ REC} / \# \text{ POS})$$

Completed Master Logs are stored chronologically by site in 3-ring notebooks.

Air Resource Specialists, Inc.
 1901 Sharp Point Drive, Suite E
 Fort Collins, CO 80525
 Phone: 970-484-7941
 Fax: 970-484-3423

**VISIBILITY MONITORING
 SLIDE LOG**

SITE: _____
 SEASON: _____
 ROLL #: _____

Slide	Date	Time	Comments
		DOC	
		9:00	
		12:00	
		3:00	
		9:00	
		12:00	
		3:00	
		9:00	
		12:00	
		3:00	
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		9:00	
		12:00	
		3:00	
		9:00	
		12:00	
		3:00	

Figure 4-6. Example Visibility Monitoring Slide Log.

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	COLLECTION AND HANDLING OF DIGITAL IMAGES
TYPE	TECHNICAL INSTRUCTION
NUMBER	4305-4100
DATE	AUGUST 2001

AUTHORIZATIONS		
TITLE	NAME	SIGNATURE
ORIGINATOR	Kristi Savig	
PROJECT MANAGER	James H. Wagner	
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QA MANAGER	Gloria S. Mercer	
OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS
	Reviewed; no changes necessary.	August 2002	
	Reviewed; no changes necessary.	August 2003	
	Reviewed; no changes necessary.	August 2004	
	Reviewed; no changes necessary.	August 2005	
	Reviewed; no changes necessary.	August 2006	
1.0	Added HRDC system / data storage media.	August 2007	

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the collection and handling procedures for digital images and data files collected with a digital camera. This TI is referenced in standard operating procedure (SOP) 4305, *Collection of Scene Monitoring Photographic Film, Videotape, and Digital Images* specifically describes:

- Tracking and documenting image storage media (e.g., memory cards, CDs, DVDs, hard drives, thumb drives, etc.) containing digital images and camera scripting settings files
- Identifying and labeling digital image files
- Validating digital image quantity and quality

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall oversee all collection and handling procedures.

2.2 DATA COORDINATOR

The data coordinator shall:

- Supply the site operator with storage media and all necessary monitoring supplies.
- Verify that scheduled site visits are performed and notify the site operator if he/she fails to make a scheduled visit.
- Review all camera documentation completed by the site operator for completeness and accuracy, and file all documentation and correspondence in the site-specific quality assurance database.
- Oversee image storage media tracking.
- Review all image storage media for quantity and quality.
- Resolve problems reported by the site operator and data technician.
- Verify that all Master Log documentation is complete and accurate.
- Determine collection and recovery statistics.

2.3 DATA TECHNICIAN

The data technician shall:

- Log all image storage media mailed to Air Resource Specialists, Inc. (ARS) from site operators.
- Complete Master Log documentation for each storage media received..
- Identify and chronologically label all image files by site.

- Report any noted documentation or data inconsistencies to the data coordinator.
- File all supporting documentation.

2.4 SITE OPERATOR

The site operator shall:

- Report any noted inconsistencies upon site servicing and storage media exchanges to the data coordinator.
- Complete a Visibility Monitoring Status/Assessment Sheet and memory card pouch label for each memory card.
- Mail filled memory cards or other storage media and accompanying documentation to ARS.

3.0 REQUIRED EQUIPMENT AND MATERIALS

The following equipment and materials are used to collect, document, and validate digital images collected from image storage media:

- Memory cards, pouches, and pouch labels
- CDs, DVDs, hard drives, thumb drives, or other storage media
- Mailing envelopes
- Visibility Monitoring Status/Assessment Sheets
- Master Logs
- Personal computer (PC) with CD writer and USB port
- Memory card reader or adapter (PCMCIA Compact Flash reader, adapter, or USB Flash Card reader)
- ARS' Air Quality Database
- Manila folders and hanging folders
- File cabinet
- 3-ring binders

4.0 METHODS

This section includes the following two (2) major subsections:

- 4.1 Digital Image Collection Procedures
- 4.2 Digital Image Handling Procedures

4.1 DIGITAL IMAGE COLLECTION PROCEDURES

Remote Digital Camera Systems (RDCS) rely on memory cards to store their collected images. High-Resolution Digital Acquisition Systems (HRDC) includes its own image computer, and can therefore utilize a variety of storage media to store their collected images.

4.1.1 Memory Card Preparation and Exchange

The camera script programs (Startup.csm and PalmCam.csm) handle all data collection and image identification processing as each image is taken. Image files (in JPEG format) and a data file record (in text format), containing all pertinent time, date, and image file name information are written routinely to the camera's exchangeable memory card. Memory cards prepared for installation should be void of past image files, but must contain all Kodak script program files in the System folder, as shown in Figure 4-1. The data coordinator formats memory cards as follows:

DELETE IMAGE FILES	Delete all JPG image files located in the memory card image folder (e.g., DC290_01).
DELETE IMAGE FOLDER	Delete the memory card image folder (e.g., DC290_01).
DELETE TEXT FILE	Delete the <i>Images.dat</i> text file located in the root directory of the memory card (see example in Figure 4-2).
VERIFY PROGRAM AND FOLDERS ARE MAINTAINED	Verify that the System folder and the Kodak script programs (Startup.csm and PalmCam.csm) are properly maintained on the memory card as shown in Figure 4-1.
RETURN CARD	Return the memory card to the site operator for future use.

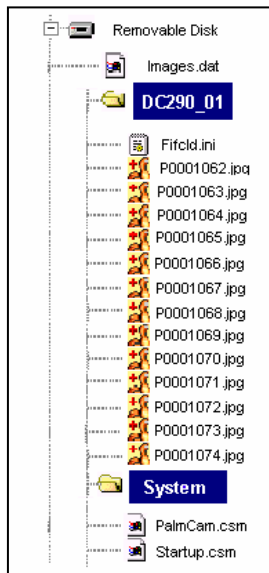


Figure 4-1. File Format and Contents of the Camera Memory Card.

DC290_01/P0000752.JPG	Date:0x082900	Time: 0x121039	Temp:752	Batt:148	Counters:000	Script:1.0/6-16-2000
DC290_01/P0000753.JPG	Date:0x082900	Time: 0x121834	Temp:770	Batt:148	Counters:002	Script:1.0/6-16-2000
DC290_01/P0000754.JPG	Date:0x082900	Time: 0x122709	Temp:788	Batt:148	Counters:003	Script:1.0/6-16-2000
DC290_01/P0000755.JPG	Date:0x083000	Time: 0x121039	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000756.JPG	Date:0x083000	Time: 0x121833	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000757.JPG	Date:0x083000	Time: 0x122709	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000758.JPG	Date:0x083100	Time: 0x121038	Temp:770	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000759.JPG	Date:0x083100	Time: 0x121834	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000760.JPG	Date:0x083100	Time: 0x122709	Temp:770	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000761.JPG	Date:0x090100	Time: 0x121039	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000762.JPG	Date:0x090100	Time: 0x121834	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000763.JPG	Date:0x090100	Time: 0x122709	Temp:842	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000764.JPG	Date:0x090200	Time: 0x121039	Temp:824	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090200	Time: 0x121835	Temp:806	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090200	Time: 0x122705	Temp:770	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090300	Time: 0x121038	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090300	Time: 0x121835	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090300	Time: 0x122705	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090400	Time: 0x121040	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090400	Time: 0x121842	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090400	Time: 0x122705	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090500	Time: 0x121040	Temp:770	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090500	Time: 0x121842	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090500	Time: 0x122705	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090600	Time: 0x104614	Temp:770	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090600	Time: 0x104614	Temp:806	Batt:148	Counters:004	Script:1.0/6-16-2000
DC290_01/P0000765.JPG	Date:0x090600	Time: 0x104614	Temp:788	Batt:148	Counters:004	Script:1.0/6-16-2000

Figure 4-2. Example Image.dat File.

4.1.2 Memory Card Capacity

The RDCS-100 can store over 250 high-resolution images on its internal 128 MB memory card. The size of each collected image will vary depending on the lighting conditions and detail of the vista being photographed. At the 1792 x 1200 resolution with “best” JPEG compression, a typical image size for a daylight mountain vista is 450 KB. Nighttime images are typically smaller than 100 KB. Approximate calculations for the maximum number of images that can be stored on a 128 MB memory card given available collection schedules are provided in Table 4-1.

Table 4-1

Image Collection and Memory Card Exchange Schedule

Collection Schedule	Number of Images for 128 MB Memory Card	Maximum Number of Days Between Memory Card Exchange
3 times per day	284 daylight images	90 days (3 months)
once per day	284 daylight images	284 days (9 months)
twice per day	284 daylight images	140 days (approximately 5 months)
Hourly	238 daylight images	17 days
(24 times per day)	170 night-time images	
Hourly (daylight: 13 times per day)	273 daylight images	21 days
5-minute intervals	235 daylight images	approximately 1.5 days
(288 times per day)	168 night-time images	
10-minute intervals (144 times per day)	252 daylight images 180 night-time images	3 days

Site operators are encouraged to monitor system operations at a minimum of two-week intervals. Regular maintenance actions include verifying equipment status, the proper number of exposures taken, adequate battery voltage, and alignment checks. Memory card exchanges can be made any time the equipment is serviced, with the maximum number of days between exchanges noted above.

4.1.3 Field Documentation

Collection procedures for digital images include site servicing visits to perform memory card exchanges at the required interval, and the mailing of filled memory cards and accompanying documentation by the site operator to ARS. When servicing a site, the operator loads a formatted memory card into the camera. Camera scripting programs record the date and time that the images are taken.

The operator also completes a memory card pouch label and attaches it to the memory card pouch. An example memory card pouch label is provided as Figure 4-3. The labeled pouch is shipped to ARS via FedEx, along with a completed Visibility Monitoring Status/Assessment Sheet.

Site Code: <u>PASA1</u> Data Seq. #: <u>003</u>
Date/Time ON: <u>11/06/2000</u>
Date/Time OFF: <u>11/20/2000</u>
Memory Card ID #: <u>FS-128-004</u>

Figure 4-3. Example Memory Card Pouch Label.

An example completed Visibility Monitoring Status/Assessment Sheet is provided as Figure 4-4. Memory cards should be sent immediately to:

Air Resource Specialists, Inc.
1901 Sharp Point Drive Suite E
Fort Collins, CO 80525
Attention: Image Data Technician

Further details on site servicing procedures and site operator-related image collection procedures can be found in TI 4120-3800, *Routine Site Operator Maintenance Procedures for the Remote High-Resolution Digital Camera System (HRDC-100)*.

4.1.4 Other Storage Media

Collection procedures for digital camera systems without memory cards may collect their images and related files via CD, DVD, hard drive, thumb drive, other storage media, or via Internet download. The site operator copies all on-site image computer hard drive files to the storage media and ships the media to ARS at least monthly, depending upon the capacity of the on-site image computer hard drive. Image files may also be remotely downloaded via the Internet.

Site ID: FTCO2 Data Sequence #: 003
Initials: KLF Memory Card ID #: ES-128-009
Shipment Tracking #: 8279 4190 3143

**REMOTE DIGITAL CAMERA SYSTEM
VISIBILITY MONITORING STATUS/ASSESSMENT SHEET**

MEMORY CARD LOADED

Today's Date: 7/3/01 Time: 17:10

- | Yes | No | |
|-------------------------------------|--------------------------|-----------------------------------------------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | PalmCam Remote program properly activated |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Viewed Controller status: |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | PDA date/time matches controller date/time |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Site status verified |
| | | Enclosure temp (°F): <u>86.5</u> |
| | | System battery voltage: <u>13.8</u> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Loaded memory card |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Camera & solenoid bracket secured on tripod plate |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Power cable jacks secure |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Controller cable jacks secure |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Camera cable jacks secure |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | TEST picture taken as expected
camera image count = <u>1</u> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Camera alignment verified |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | PDA power turned off |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Enclosure door locked and
door seal clamps tightened |

MEMORY CARD REMOVED

Today's Date: 7/17/01 Time: 16:08

- | Yes | No | |
|-------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | System found in proper condition |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | PalmCam Remote program properly activated |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Viewed Controller status: |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | PDA date/time matches controller date/time |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Site status verified |
| | | Enclosure temp (°F): <u>88</u> |
| | | System Battery Voltage: <u>14.1</u> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Images collected as expected,
controller exposure count = <u>40</u> <i>13 days x 3 = 39
1 test shot</i> |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Power, controller, camera jacks secure |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Camera & solenoid bracket removed from tripod plate |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Exchanged memory card |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Memory card pouch properly labeled |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Memory card and assessment sheet shipped
(denote shipment tracking # above) |

DESCRIBE WEATHER AND VISIBILITY CONDITIONS for the duration of the monitoring period:

Daily afternoon thunderstorms. Hot

Current % Cloud Cover 10% Ambient Temperature °F 86 94 50
Now Max Min

COMMENTS/ACTION TAKEN

Exchanged PDA batteries on 7/17/01
checked all other batteries - they are fine.
Took test photo on 7/3/01 @ 17:15.

SUPPLIES NEEDED

None at this time.

Ship white copy and memory card to:

**Air Resource
Specialists, Inc.**
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

Figure 4-4. Example Remote Digital Camera System Visibility Monitoring Status/Assessment Sheet for the Remote High-Resolution Digital Camera System (RDCS-100).

4.2 DIGITAL IMAGE HANDLING PROCEDURES

Image handling begins when the full storage media are received at ARS. Memory cards are used with RDCS systems while a variety of other storage media are used with HRDC systems.

4.2.1 Memory Card Check-In

Receipt of the memory cards is recorded on a site Master Log and in the ARS Air Quality Database (AQDB). Once the cards are received at ARS, they are put into a PCMCIA Compact Flash reader, adapter, or USB Flash Card reader and downloaded to a PC. To download, the data coordinator accesses the AQDB:

- From the Load Data menu, select **Receive Memory Cards**.
- Select the **Log Memory Card Received** tab.
- In this window, enter the *site* and *vista*.
- Press the **Copy** button to copy all files from the memory card to the local c:\drive.

An example Log Memory Card Received window in the AQDB is provided as Figure 4-5.

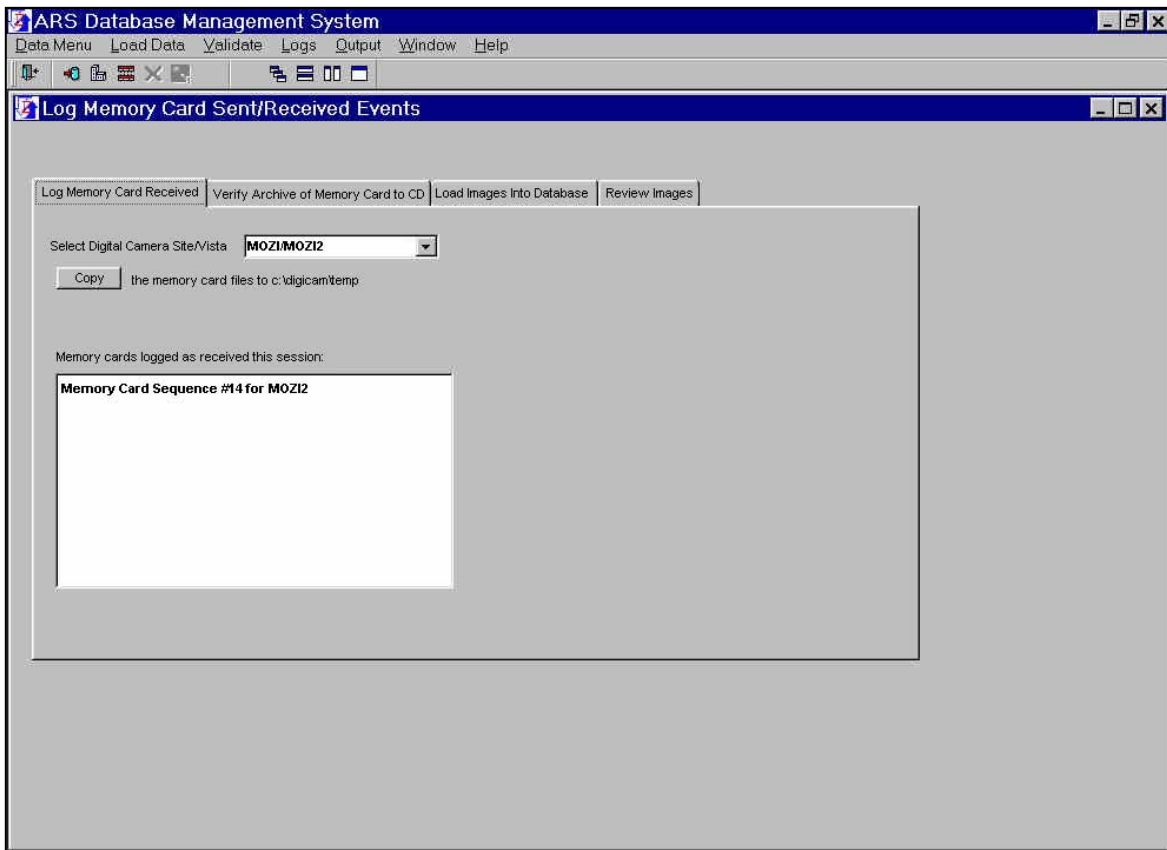


Figure 4-5. Log Memory Card Received Screen in the AQDB.

The completed Visibility Monitoring Status/Assessment Sheet, which accompanies each mailed memory card is also reviewed by the data coordinator (see Section 4.2.2). Receipt of memory cards and status/assessment sheets are documented on the Master Log (see Section 4.2.3).

A detailed flowchart of handling procedures for RDCS systems using memory cards is shown in Figure 4-6.

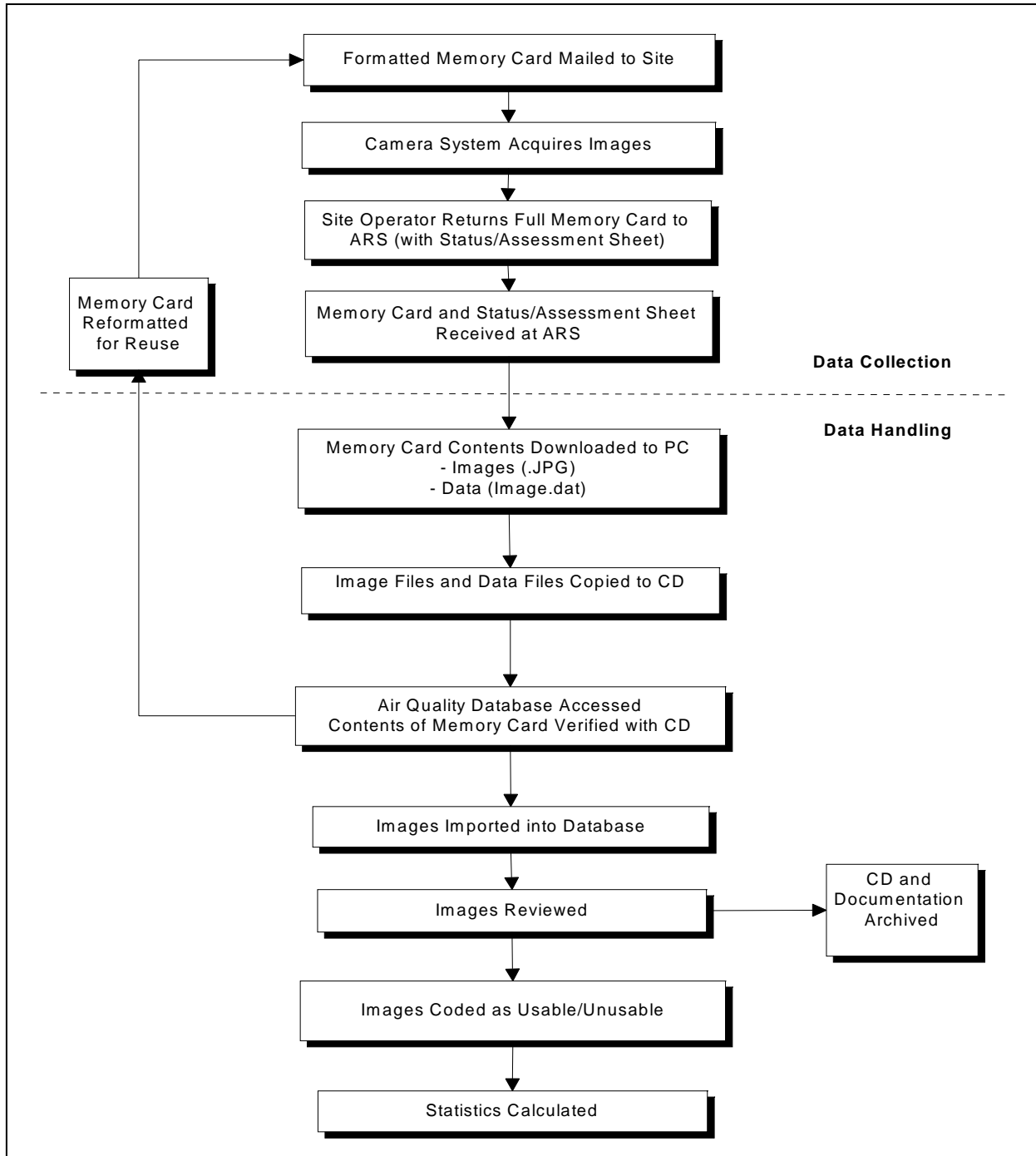


Figure 4-6. Flowchart of the Image Collection and Handling Procedures for RDCS Systems Using Memory Cards.

4.2.2 Visibility Monitoring Status/Assessment Sheet Review

The Visibility Monitoring Status/Assessment Sheet, used with RDCS systems and memory cards, is thoroughly reviewed by the ARS data coordinator to verify proper camera operations and note any weather anomalies or requested operational supplies. Any discrepancies are documented by site and memory card number on the Master Log and corrective action is initiated. Any requested monitoring supplies or photographic components are shipped within 24 hours, provided sufficient backup equipment/supplies are available.

4.2.3 Other Storage Media Check-In

Receipt of the CD, DVD, hard drive, thumb drive, or other storage media is similar to receiving memory cards. The storage media identification number is recorded on a site Master Log and in the ARS Air Quality Database (AQDB). Once the storage media is received at ARS, its contents is downloaded to a PC.

A detailed flowchart of handling procedures for HRDC systems using other storage media is shown in Figure 4-7.

4.2.4 Master Log Completion

Completion of the Master Log is essential to ensure quality image documentation. Information recorded on the Master Log is partially derived from site operator documentation; the remainder of the information is recorded for tracking purposes during image handling. An example Master Log is provided as Figure 4-8. The following information is entered on the Master Log:

- Season
- Site name and abbreviation
- Year
- Contact persons (site operators)
- MEDIA # - Consecutive, chronological memory card, CD, hard drive, or other storage media number by site
- LOG – (applies to memory cards only) *Yes* if a status/assessment sheet was completed and accompanies the memory card, *no* if a status/assessment sheet was not sent with the memory card
- DATE LOG - The beginning and ending dates of the images contained on the storage media, as verified by review of the images
- TIME LOG - The beginning and ending times of the images contained on the storage media, as verified by the review of the images

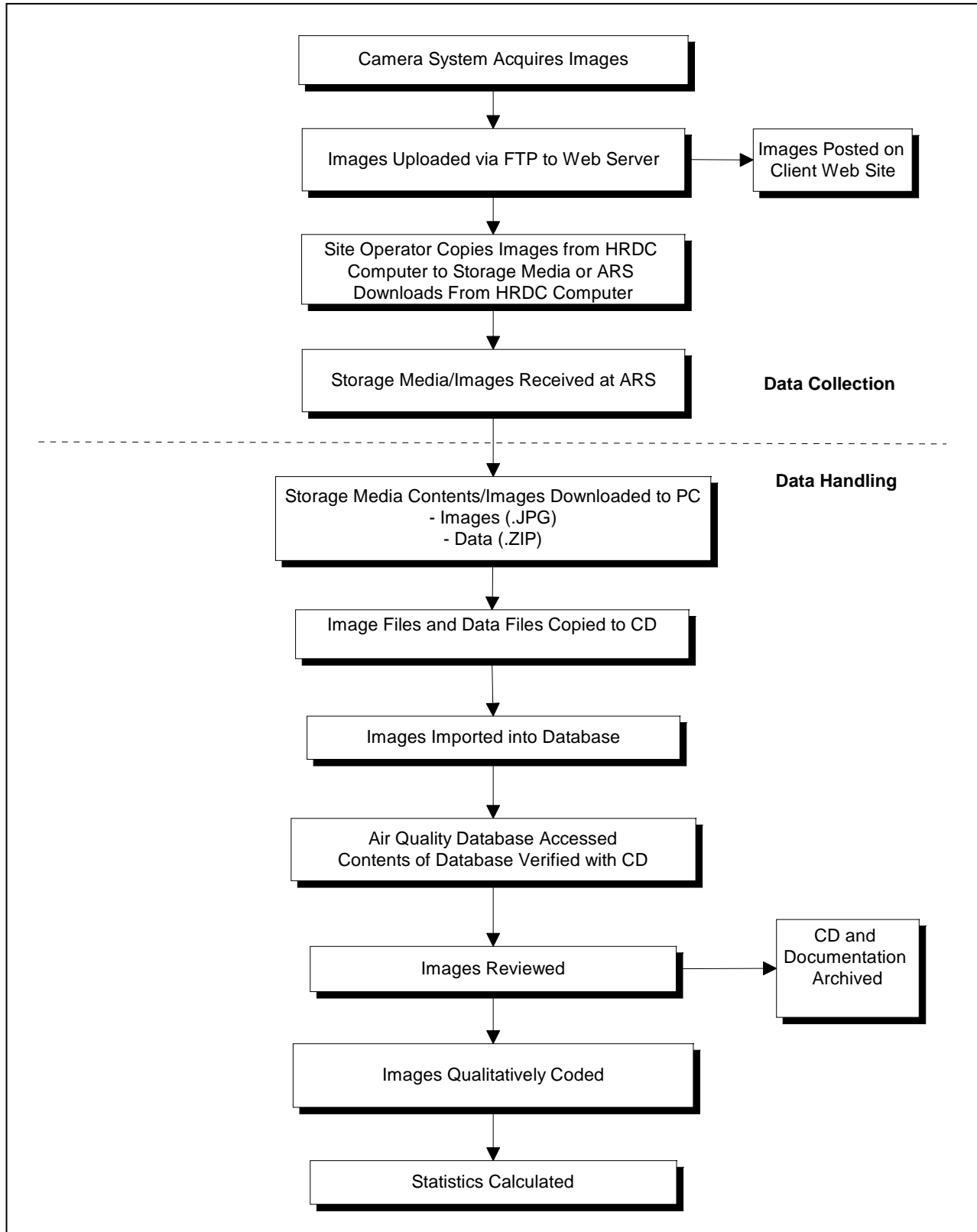


Figure 4-7. Flowchart of the Image Collection and Handling Procedures for HRDC Systems Using Varied Storage Media.

DIGITAL MASTER LOG

1st Quarter

CONTACTS

2nd Quarter

3rd Quarter

4th Quarter

Location

Year

Media #	Log	Date Log	Time Log	# Pos.	# Rec.	# Good	Problems/Events	Correspondence / Supplies shipped Equipment Change

N:\Project\ARS\FORMS\CAMERA\DIGITAL MASTER LOG.doc

Figure 4-8. Example Master Log.

- # POS - Number of images possible on the storage media, upon review of storage media
- # REC - The actual number of images taken, recorded after review and validation of the storage media
- # GOOD - The actual number of images that are usable for qualitative analysis
- PROBLEMS/EVENTS - Notation and description of problems or events pertaining to each specific storage media
- CORRESPONDENCE/EQUIPMENT CHANGE - Notation and description of correspondence or communication pertaining to each specific storage media, the type and date of replacement equipment changes or modifications

The data coordinator verifies that all Master Log documentation is complete and accurate. Master Logs and any accompanying documentation are chronologically stored in 3-ring notebooks by site.

4.2.5 Image and Data Verification

After the image and data files are extracted from the storage media and placed on a PC, they are also written to a CD for archive. Refer to TI 4610-5040, *Digital Image Archives*, for archive procedures. For memory cards, the data coordinator accesses the AQDB and verifies the contents of the memory card with the contents of the CD archive, as follows:

- From the Load Data menu, select **Receive Memory Cards**.
- Select the **Verify Archive of Memory Card to CD** tab.
- In this window, click the **Read Card** button.
- Click the **Read CD** button to view contents of each medium in the windows provided.
- Click the **Verify Archive** button to verify that both collections of files are the same.

Figure 4-9 shows an example Verify Archive of Memory Card to CD screen.

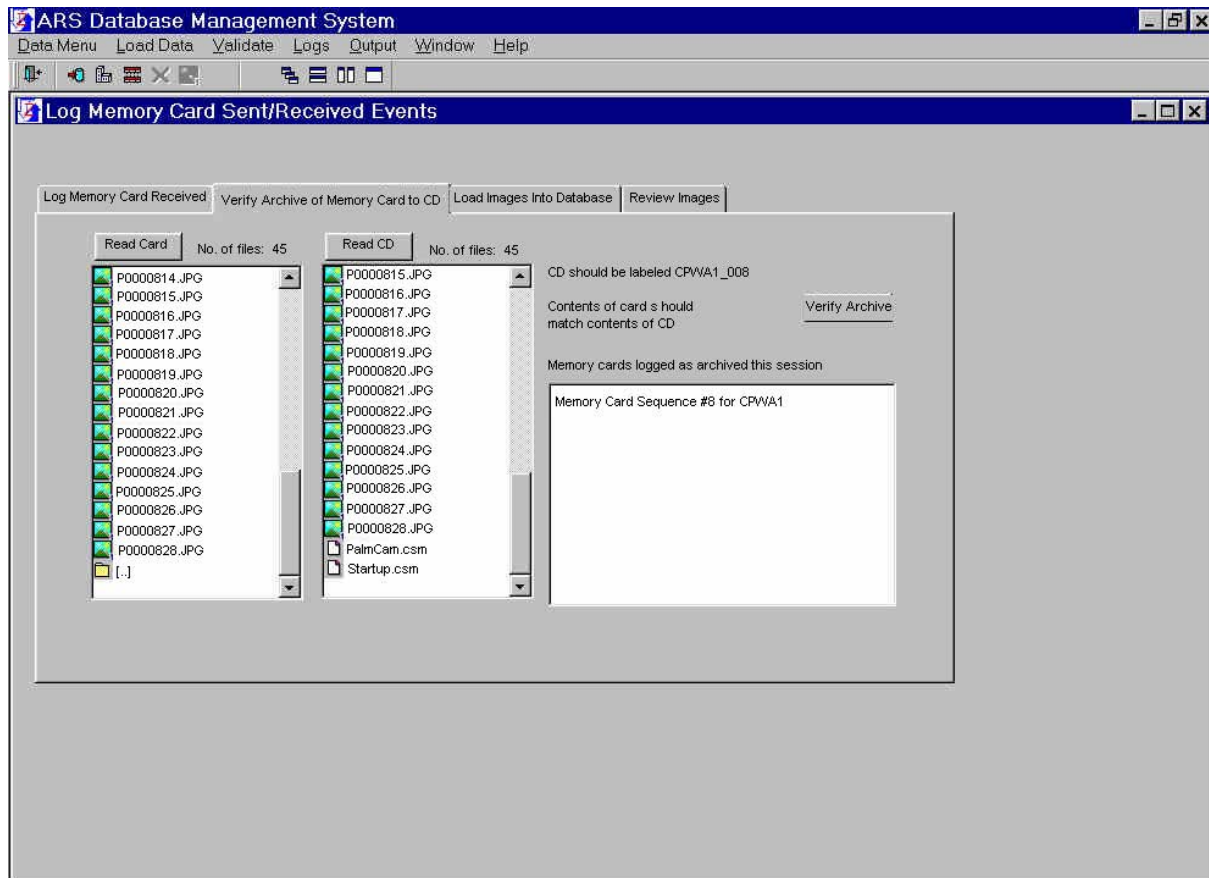


Figure 4-9. Verify Archive of Memory Card to CD Screen in the AQDB.

For other types of storage media, the data coordinator visually verifies the files on the PC (copied from the storage media) with the files copied onto CD for archive.

4.2.6 Loading Files Into Database

After the archive has been verified, all images and data from the memory card are loaded into the AQDB as follows:

- From the Load Data menu, select **Receive Memory Cards**.
- Select the **Load Images Into Database** tab.

Figure 4-10 shows an example screen.

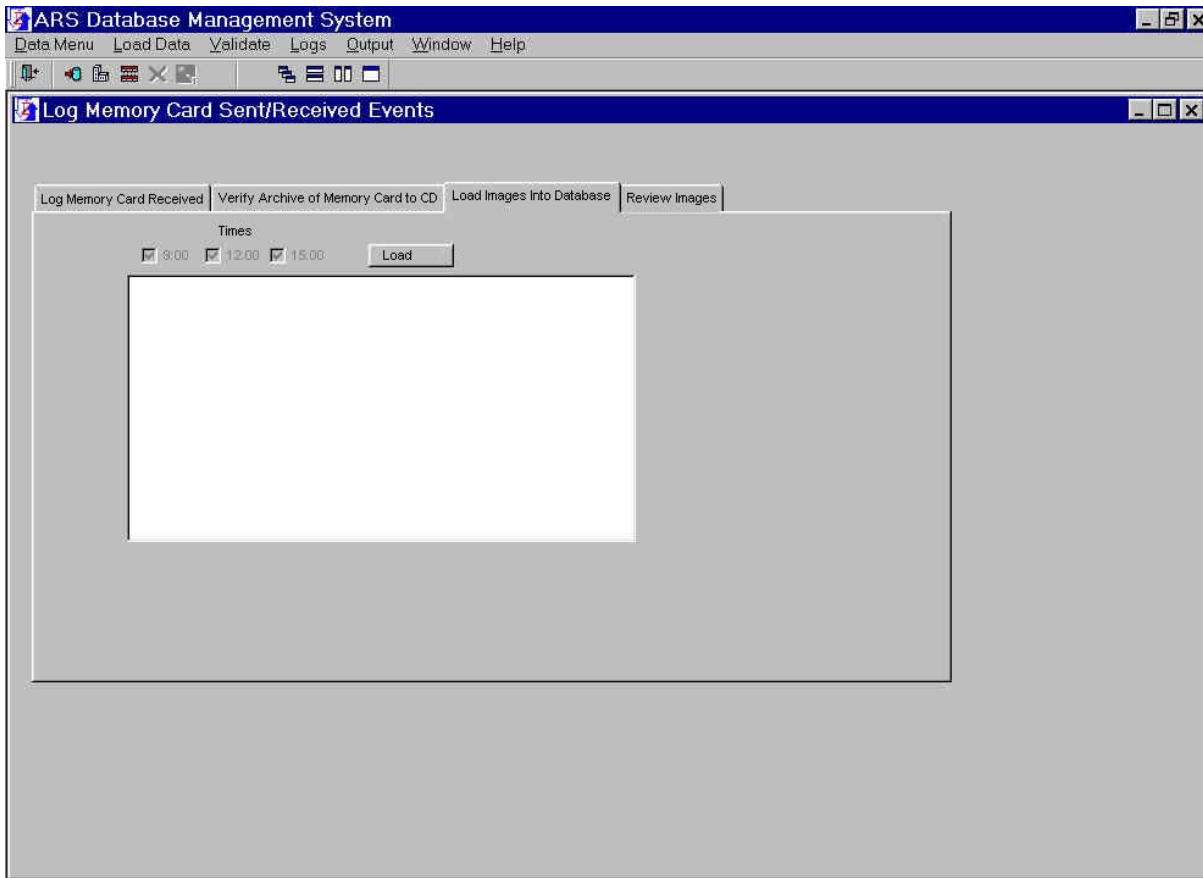


Figure 4-10. Load Images into Database Screen in the AQDB.

For other types of storage media, the 0900, 1200, and 1500 images are uploaded from the camera system to the Web server for placement on the image Web site, and also uploaded to the AQDB daily. If any images are missing on the image Web site (and AQDB), the data coordinator copies the missing images from the storage media mailed in, into the AQDB, by accessing the AQDB and selecting the **Load Web and CD Images** tab. Then select the drive and folder where the images are located on the storage media and press the **Load into Database** button.

4.2.7 Image and Data Review

All operator documentation are thoroughly reviewed with the images. Specific procedures include:

- Reviewing operator comments and logged storage media collection dates.
- Reviewing logged storage media sequence number with AQDB sequence reference.
- Reviewing the *Image.dat* file (refer to Figure 4-2) to ensure the proper sequence of images was collected.
- Checking for the proper site abbreviation and zoom parameters.

- Reviewing all images for proper exposure, alignment, and zoom angle using image browsing software such as Kodak Shoebox, Thumbs Plus, or a customized image review database application.
- Databasing all associated image acquisition parameters with each image.
- Blank-filling data records that were skipped or missing.

Refer to Figure 4-11 for an example Review Images tab in the AQDB.

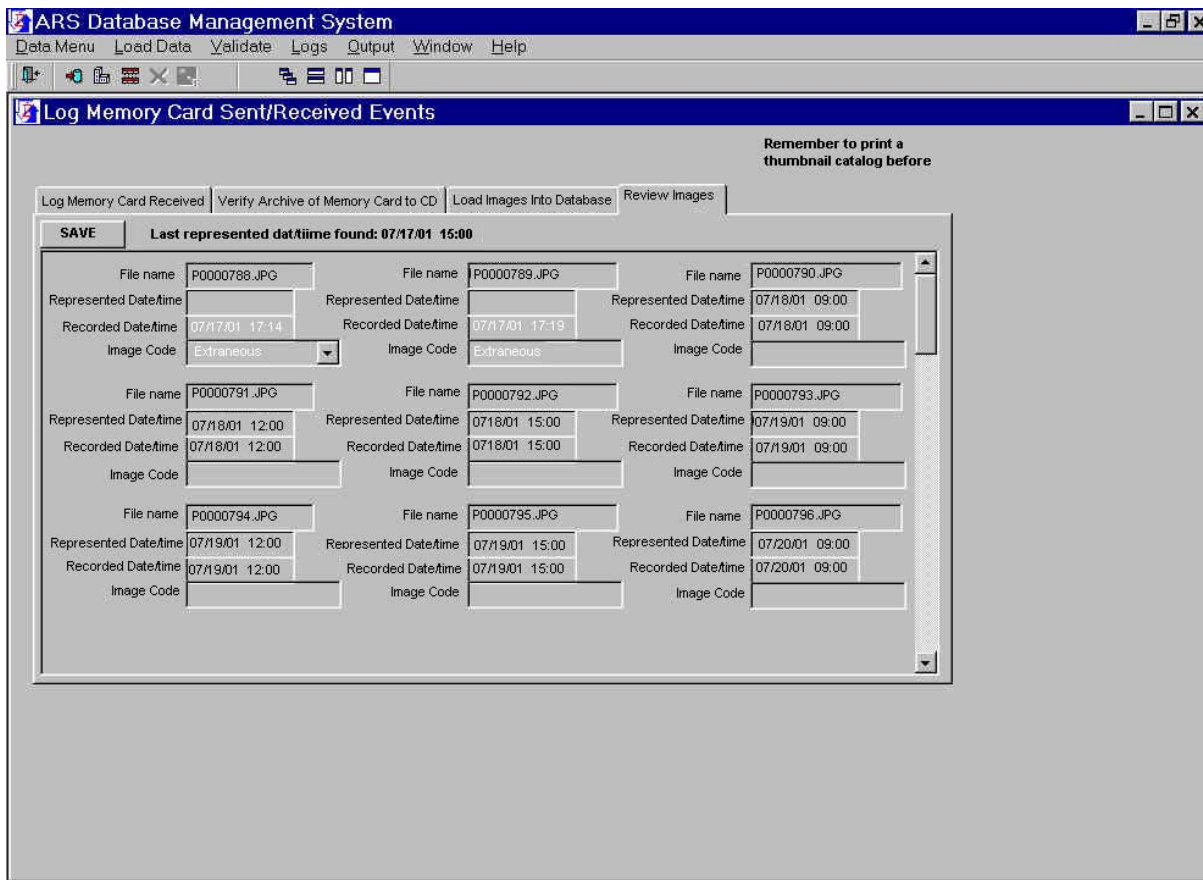


Figure 4-11. Review Images Screen in the AQDB.

Images are further reviewed by the data coordinator to verify that:

- The number of images corresponds to the data collection period noted on the storage media label.
- Date and time are correct.
- The vista alignment is correct.

- The vista focus is correct.
- No exposure inconsistencies exist.
- The temperature and battery voltage is adequate.

After verification that all information has been correctly documented, the data coordinator then creates a catalog of the storage media's contents (see Figure 4-12). The thumbnail catalog is printed out on a laserjet printer for archive with the CD. A copy of the Image.dat file, and the status/assessment sheet are also included for archive.

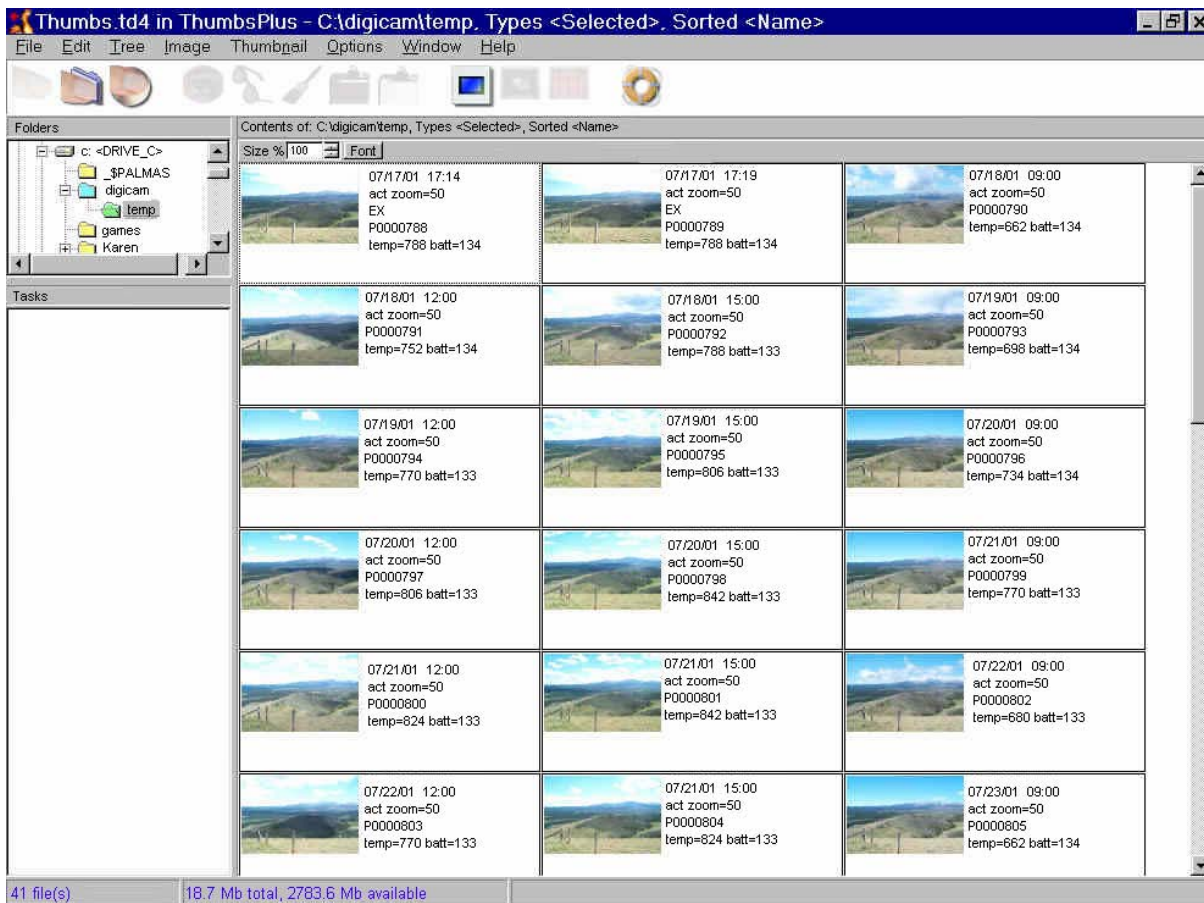


Figure 4-12. Example Catalog Printout of Storage Media Contents.

All images are visually reviewed on the PC and are considered usable (good) for further qualitative analyses, except for:

- Supplemental visibility images.
- Out-of-alignment images (e.g., the target is not in the view).
- Extremely under- or overexposed images.

- Out-of-focus images; distinct features cannot be identified.
- Images taken through a fogged or icy enclosure window.

Any discrepancies found are documented by storage media number on the Master Log and corrective action is initiated by the data coordinator. (Refer to TI 4120-3900, *Emergency Maintenance and Troubleshooting Procedures for the Remote High-Resolution Digital Camera System (RDCS-100)* and TI 4120-3950, *Emergency Maintenance and Troubleshooting Procedures for the High-Resolution Digital Camera System (HRDC)*). Any problems or interesting events observed on the images are reviewed with the project manager.

4.2.8 Final Collection and Data Recovery Statistics

Master Logs are completed and verified by the data coordinator at the end of each season to summarize the data collected at each site and to thoroughly document data recovery and observed equipment operation discrepancies, as well as actions taken to resolve such discrepancies. The completed Master Logs reflect final collection statistics for the period.

Data recovery statistics are compiled seasonally by the data coordinator. The primary data collection statistic calculated is:

$$\% \text{ Overall Data Recovery} = (\# \text{ REC} / \# \text{ POS})$$

Completed Master Logs are stored chronologically by site in 3-ring notebooks.