BEEF CARCASS INSTRUMENT GRADING PROCEDURES

1.0 Purpose

1.1 The U.S. Department of Agriculture (USDA), Agricultural Marketing Service (AMS), Livestock and Seed Program (LSP), Grading and Verification Division (GVD) will implement a program to predict beef carcass quality and yield factors made by approved instrument systems. This Instruction and references from the Standards Division (SD) define all procedures to implement this program. Plants are encouraged to utilize USDA approved technologies to augment the USDA grading process of beef carcasses presented for official grading. This voluntary program may be utilized by a plant at their discretion, but must comply with GVD Instructions and SD requirements in order to be recognized and relied upon by the AMS Agent in conducting official duties.

2.0 Scope

2.1 The intent of utilizing beef carcass instrument grading augmentation is to improve the accuracy and uniformity of grade application nationwide. Instrumentation grade data may be obtained from both sides of a carcass or from either side. When both sides are available and the plant only collects grade data from a single side, the plant instrumentation operator shall determine which side will be used to collect the best quality and/or yield grade data. When neither side of a carcass can be used for instrumentation assessment, the carcass may be presented for traditional grading provided an accurate grade determination can be made by the AMS Agent or re-presented for instrument assessment if further preparations are conducted for proper image capture.

3.0 Instrument and Cooler Operation

3.1 Applicant Responsibility

3.1.1 Provide the AMS Agent with approved procedures for startup and re-startup in the event of instrumentation failure during a single shift.

3.1.2 Provide documentation that the instrument operator(s) and/or technician(s) is/are trained.

3.1.3 Use only instruments approved by the SD.

3.1.4 Assure carcasses are adequately chilled, properly split, and properly ribbed a minimum of ten minutes prior to presentation to the instrument and presented for grading in accordance with GVD Instruction 500, Beef, Bullock and Bull Grading Methods and Procedures.

3.1.5 Operate instrument technology in accordance with the manufacturer's guidance.

3.1.6 Ensure instrument prediction information and images are provided to the AMS Agent for proper monitoring of the system.

3.2 AMS Responsibility

3.2.1 Review, understand, and apply the approved start-up procedures.

3.2.2 Verify the training of the operator and technicians are current (within the last 12 months) via a training log or other acceptable documentation.

3.2.3 Verify, as applicable, that the instrument(s) is/are on an approved list via serial numbers, etc.

3.2.4 Verify that all components (camera head, cable and controller box) have the same ID number.

3.2.5 Assign a sufficient number of AMS agents to provide an efficient and effective service.

3.2.6 Using the Instrument Validation form (Exhibit A), monitor calibration/validation start-up immediately prior to the start of operations, as applicable. Ensure that the marbling validation readings are within the tolerances established by the SD in the Instrument Marbling Validation Cards - Target and Tolerance Values (Exhibit B). Additional validation will occur at the mid-shift meal break and breaks longer than 30 minutes. (See VERSOP dated 10-12-11).

3.2.7 Record the average marbling check scores (low, medium, and high) as well as the standard deviation for each card on the Instrument Validation (Exhibit A) form and check the "pass" checkbox. If the marbling check system fails, check the "fail" checkbox, notify applicant management, and discontinue use of the instrument until the problem causing the noncompliance has been corrected. Additionally, the AMS agent will record average value for the USDA marbling card as well as the standard deviation. These values are not considered when validating the instrument and are used for maintenance issues only. At the option of the applicant, traditional grading by the AMS Agent may occur until corrective action is completed. The system must be rebooted and allowed to warm up a minimum of 45 minutes. After corrective action,

monitoring/validation will be repeated before a restart of instrumentation operations.

4.0 Carcass Presentation Phase

4.1 Applicant Responsibility

4.1.1 Ensure carcasses are presented split and ribbed in accordance with the United States Standards for Grades of Carcass Beef, January 31, 1997.

4.1.2 Provide an employee to identify the carcasses with the official USDA grade shields and acceptance stamps. Staffing and position placement of AMS Agents for this purpose will be determined locally by the AMS supervisor on a case-by-case basis.

4.1.3 In chain grading operations, provide a shut-off switch for the AMS grader to stop the operation when additional time is needed to override the instrumentation grade prediction.

4.2 AMS Responsibility

4.2.1 Use the Carcass Presentation Phase (Exhibit C) to determine sample size, Acceptable Quality Level (AQL) verification levels, and switching procedures. The “normal” verification level will be used for initial startup of instrumentation grading.

4.2.2 AQL carcasses shall be randomly selected during each shift, tagged, and put on a stationary rail with adequate lighting (100 foot candles minimum).

4.2.3 Ensure “common” GVD equipment is used to apply grade and certification identification stamps when accepting instrument grade factor data output. Plant employees applying grade stamps must be in close proximity to the AMS agent so that the proper grade carcass identification can be monitored.

5.0 Image –Capture Phase

5.1 Applicant Responsibility

5.1.1 Ensure images are sharp and clear (properly focused and not blurred).

5.1.2 Ensure images are free of processing debris that would negatively impact instrument prediction.

5.1.3 Ensure camera placement includes the 12^{th}-13^{th} rib cross section.

5.1.4 Ensure quality control measures are being conducted to verify proper alignment of camera mechanism on carcass surface.

5.1.5 Provide the AMS Agent with a copy of the unprocessed and processed images for each carcass selected for the AQL review of image capture.

5.2 AMS Responsibility

5.2.1 In accordance with the Instrument Grading Record form (Exhibit D) and AMS Visual Aids (Exhibit E), carcasses shall be randomly selected on line and placed on a stationary rail for review to determine image acceptability.

5.2.2 The AMS Agent will complete Exhibit D as indicated, over tracing, under tracing, and areas of debris on the ribeye shall be recorded in square inches as measured with a ribeye grid.

5.2.3 Proper split, ribbing, correct grade stamp, sharp/clear image, and fat thickness tracing shall be indicated with a “0” (zero) for correct or a “1” (one) for not correct.

6.0 Official Grade Determination Phase

6.1 In addition to monitoring the plant operational system as described above, the AMS Agent is responsible for the official grade determination in accordance with the United States Standards for Grades of Carcass Beef, January 31, 1997, within the following limitations.

6.2 AMS Responsibility

6.2.1 The on-line AMS Agent will accept the instrument grade factor data output for each carcass unless:

A. Carcasses are not presented in accordance with official USDA standards and GVD Instruction 500, Beef, Bullock and Bull Grading Methods and Procedures. Carcasses not properly presented would include carcasses exhibiting on one or both side as applicable:

1. Ribbed on a bias

2. Fat trim or fat pulls (if yield grading)

3. Mis-splits not allowing proper evaluation of the bone surfaces

4. Carcasses exhibiting a surface other than the 12th-13th rib cross section

B. Carcasses presented have:

1. Frozen ribeyes

2. Dark cutting characteristics

3. Advanced maturity for instrument assigned grade

4. Blood shot area of more than a small amount

5. Callous areas in excess of ½ square inch

C. Carcass ID number does not match the monitor carcass ID number.

D. Marbling prediction scores are drastically different (100 marbling degrees) than the marbling evaluated by the AMS Agent or indications that the data does not match the carcass even if the carcass ID numbers match. (E.g., instrument marbling is Slightly Abundant (SLA) and grader accessed marbling is Minimum Moderate (MD^0) or less.

6.2.2 Carcasses will be eligible for instrument or visual (traditional) assessment for the purpose of re-grading as requested by the plant. If presented for visual re-grade evaluation, graders will use the following criteria.

A. Utilize tolerances established by the SD before changing instrument prediction.

B. Override instrument prediction if the AMS Agent determines that:

1. Visual assessed marbling is 35 units or greater different from the instrument and would result in a different quality grade.

2. Ribeye area is 1.0 square inch or greater different from the instrument and would result in a different yield grade, or carcass schedule certification decision. (If applying yield grades.)

3. Fat thickness is 0.2 or greater different from the instrument.

4. Preliminary yield grade (PYG) is 0.5 inch or greater different from the instrument.

5. Final yield grade is 0.50 or greater different from the instrument and would result in a different yield grade.

Note: The override determination is made independently for 1, 2, 3, and 4 above, and is applied even if only one side of the carcass was properly imaged.

6.2.3 Carcasses presented for re-grades using instrument assessment factors may be re-imaged by the on-line instrument on the grading chain, or by an approved portable instrument on stationary re-grade rails. Both on-line and portable instruments must be calibrated and validated daily in accordance with this Instruction. Carcasses may be re-imaged a maximum of three (3) time for re-grade purposes. Instrument operators must wait a minimum of five (5) seconds before taking additional images to allow the heat from the previous image capture to dissipate. Graders will use the acceptable image(s) resulting in the highest (best) grade. Over and under tracing of the ribeye muscle is not a consideration for instrument marbling prediction.

6.3 Applicant Responsibility

6.3.1 Provide instrument assessment data and ribeye images (color or black and white) to the AMS Agent for each carcass presented for visual re-grading.

6.3.2 Ensure a mechanism is in place to reflect any change of grade made by the AMS Agent.

6.3.3 Re-grades presented for visual assessment must be presented to the AMS Agent in adequate lighting (100 foot candle power minimum).

6.3.4 Provide the AMS Agent daily quality and yield grade counts by shift by grader.

7.0 Gross Non-compliance

7.1 The AMS Agent may suspend the use of grade factors from instrumentation systems at any time gross non-compliance is observed and cannot be immediately corrected. Examples of gross non-compliance:

7.1.1 The displayed instrumentation image or instrument prediction does not match the carcass presented for grading.

7.1.2 Final yield grade prediction score is greater than 0.5 (1/2 yield grade) different than yield grade measured by AMS agent.

7.1.3 The monitor does not display carcass information while the grading chain is running.

7.2 Traditional grading by the AMS Agent may occur until corrective action has been taken.

8.0 Report of Numbers Graded

8.1 Applicants will provide a count of the total carcasses transferred and presented for grading and the total number of head graded by each quality grade, yield grade, or G Schedule, and the average weight for carcasses transferred for grading, on a daily basis. This information should be made available to the grader on the day following grading.

☐ This document has been revised

Exhibit A

1/29/2012

U.S. DEPARTMENT OF AGRICULTURE AGRICULTURE MARKETING SERVICE **INSTRUMENT VALIDATION**	Plant (Name, City, State)	Facility Number

Date of Check	Time of Check	Grader Name (Example: GRADER, J.)	Shift	Camera ID	Start-up Procedures Followed (✓)	Instrument Operator/ Technician Trained (✓)	Equipment ID on Approved Device List (✓)	All Equipment Component Numbers Match (✓)	Marbling Check Average Score			Standard Deviation			Pass (✓)	Fail (✓)	USDA Card	Standard Deviation
									Low	Medium	High	Low	Medium	High				
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Exhibit B

Instrument Marbling Validation Cards – Target and Tolerance Values

Table 1 lists the target values and tolerance limits for the current 4 card marbling set. Use of the low, medium and high marbling verification cards is discussed in item 4 of section Prior to the Start of Operation in the document entitled Instrument Verification Standard Operating Procedure (VERSOP-revised 10-12-11.docx). The USDA marbling card is used to collect data for system maintenance purposes only. The current software versions will automatically acquire and average 3 readings in "Marbling Check." If the system fails to read within the approved ranges or if the standard deviation exceeds 10 on any card the process is to be repeated. If the system fails to validate after two attempts the system shall be re-booted and allowed to warm up for 45 minutes prior to a third and final test.

Table 1.
Verification Card Tolerances

Name	Card	Marbling Target	Tolerance	Low Limit	High Limit
Low Marbling	Slight 10	297	20	277	317
Med Marbling	Modest 40	543	34	509	577
High Marbling	Slightly Abundant 00	694	38	656	733
USDA	Small 00	383	28	355	412

Exhibit C

Carcass Sample Size

Carcass Transfer Per Shift	Verification Levels		
	Tightened	Normal	Reduced
	Sample Size		
2-170	12	5	3
171-288	12	6	3
289-544	16	8	3
545-960	20	10	4
961-1,632	24	12	5
1,633 and larger	32	12	5

Note: When the lot size is less than or equal to the sample size, 100 percent attributes inspection is required.

Switching Procedures

Normal to reduced	When normal sampling is in effect, reduced sampling will take place when 10 consecutive samples indicate acceptable procedural compliance.
Reduced to normal	When reduced sampling is in effect, normal sampling will take place when 1 sample indicates an unacceptable performance.
Normal to tightened	When normal sampling is in effect, tightened sampling will take place when 2 samples with the last 5 indicated an unacceptable performance.
Tightened to normal	When tightened sampling is in effect, normal sampling will return when the cause is corrected and 5 consecutive acceptable samples indicate acceptable procedural compliance

When 2 verifications within the last 10 or fewer samples indicate an unacceptable performance under a tightened verification level, MGC Branch Management will schedule an additional AMS agent to ensure that the cause of the noncompliance is corrected and that the carcasses impacted by the noncompliant action be graded as accurately as possible. This assignment of an additional AMS agent will be in effect until the unacceptable performance has been corrected.

The LSP reserves the right to discontinue the establishment's approval if the reviews remain tightened for at least two consecutive weeks. If this should occur and the instrument grading process is restarted, it shall be reinstituted at the tightened verification level.

If instrument use is interrupted because of mechanical or electrical reasons, resumption of use shall begin using the verification level at the time of the interruption.

☐ This document has been revised

Exhibit D

01/03/11

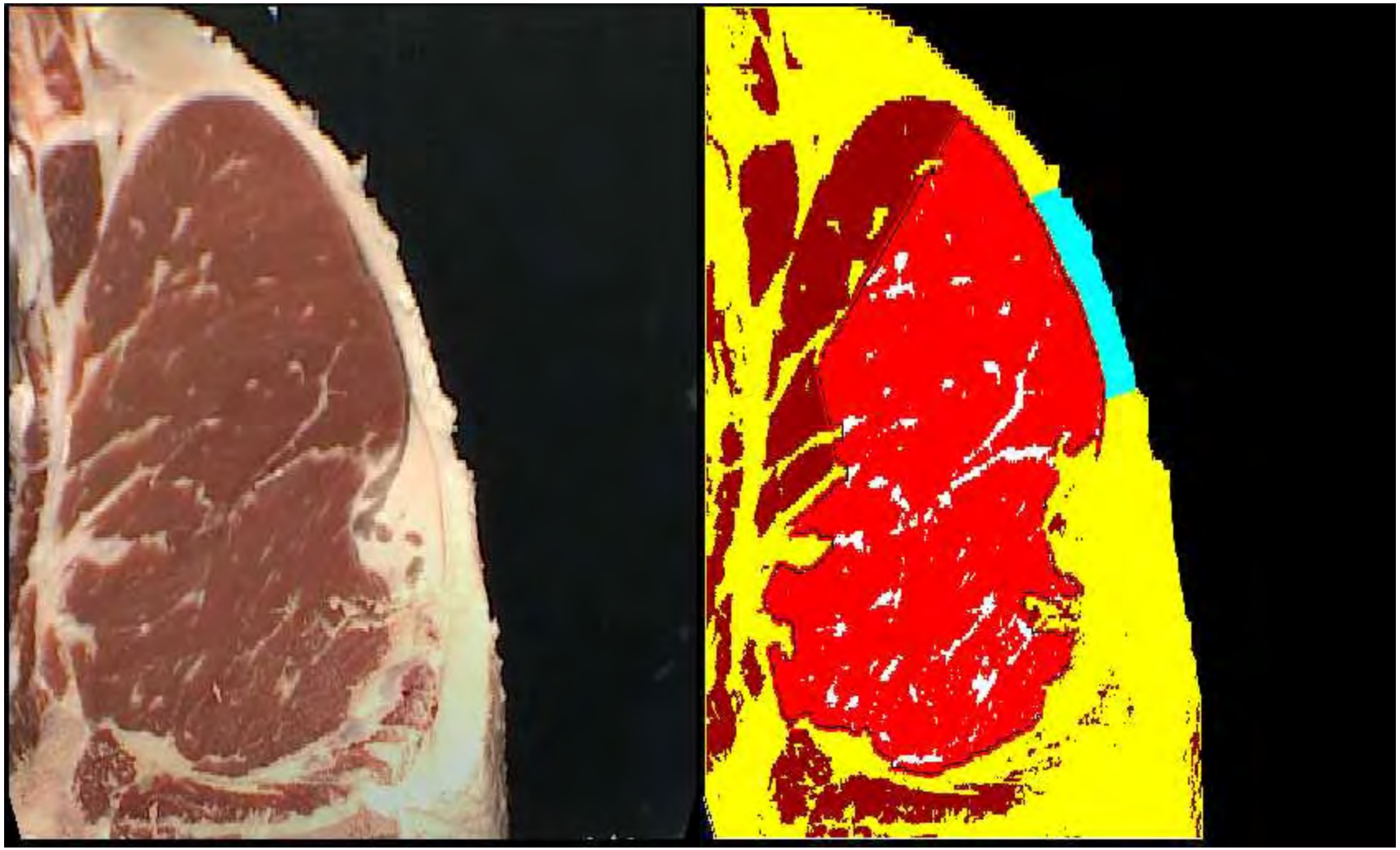
U.S. DEPARTMENT OF AGRICULTURE AGRICULTURAL MARKETING SERVICE INSTRUMENT GRADING RECORD						Plant (Name, City, State)				Camera ID		Facility Number					
						Area Over Traced (in^2)		Area Under Traced (in^2)		Area of Debris (in^2)							
Date Graded	Shift	Verification Level (Normal, Tightened, or Reduced)	Sample Size	Grader Name (Example: GRADER, J.)	Carcass ID Number	Side 1	Side 2	Side 1	Side 2	Side 1	Side 2	Split (0, 1)	Ribbing (0, 1)	Correct Grade Stamp (0, 1)	Sharp/Clear Image (0, 1)	Proper Fat Thickness Tracing (0, 1)	

Exhibit E

EXAMPLE # 1

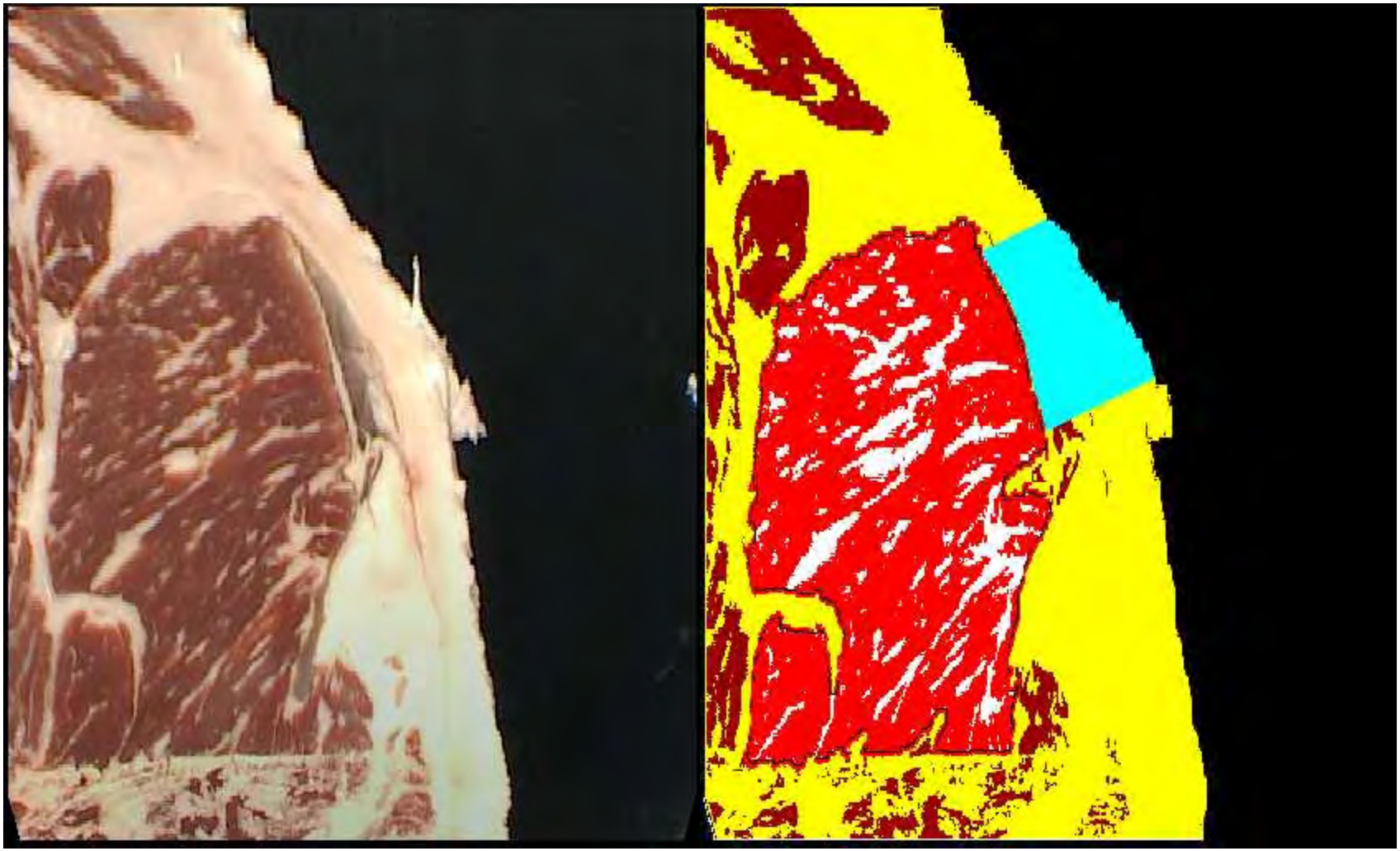
Satisfactory raw image and processed image.

Example # 2



Bone-dust smear is acceptable, thus a satisfactory raw image but under traced ribeye area. Under tracing defect.

Example # 3

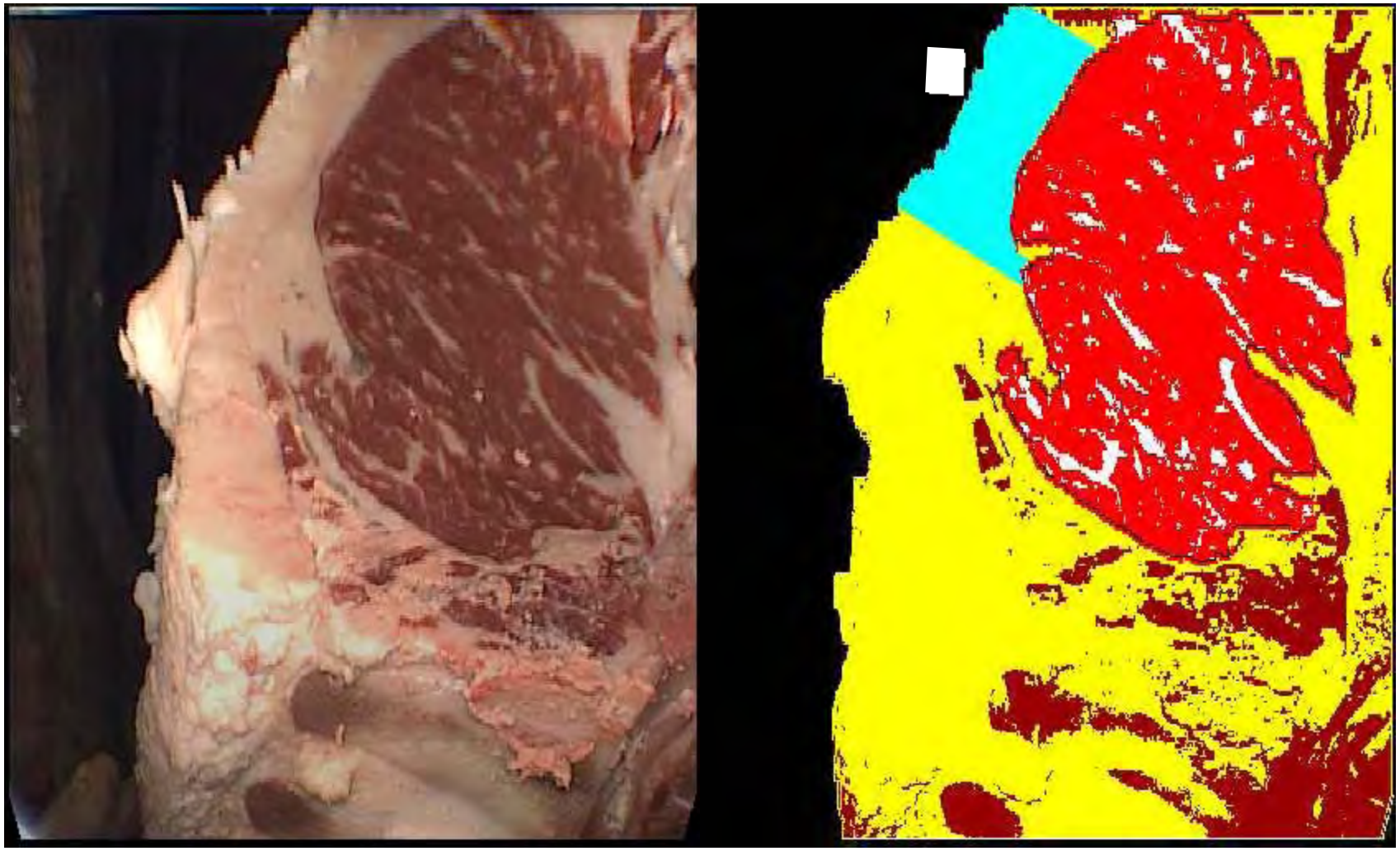


Bone-dust results in an under traced ribeye and the water pocket results in an over estimation of fat thickness. Fat thickness, under tracing, and debris defects.

Example # 4

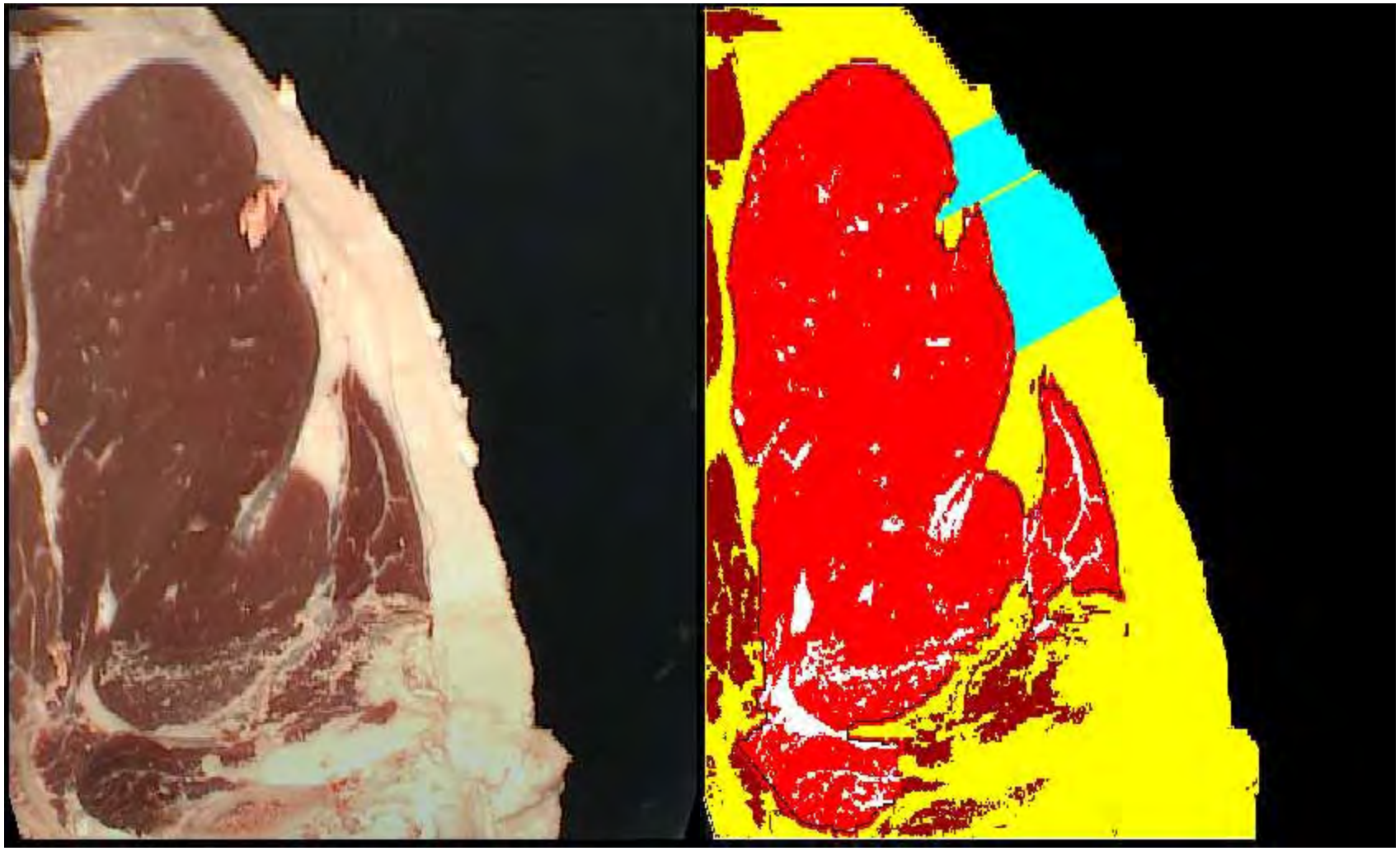
Carcass debris results in an under traced ribeye area. Over tracing, under tracing, and debris defects.

Example # 5



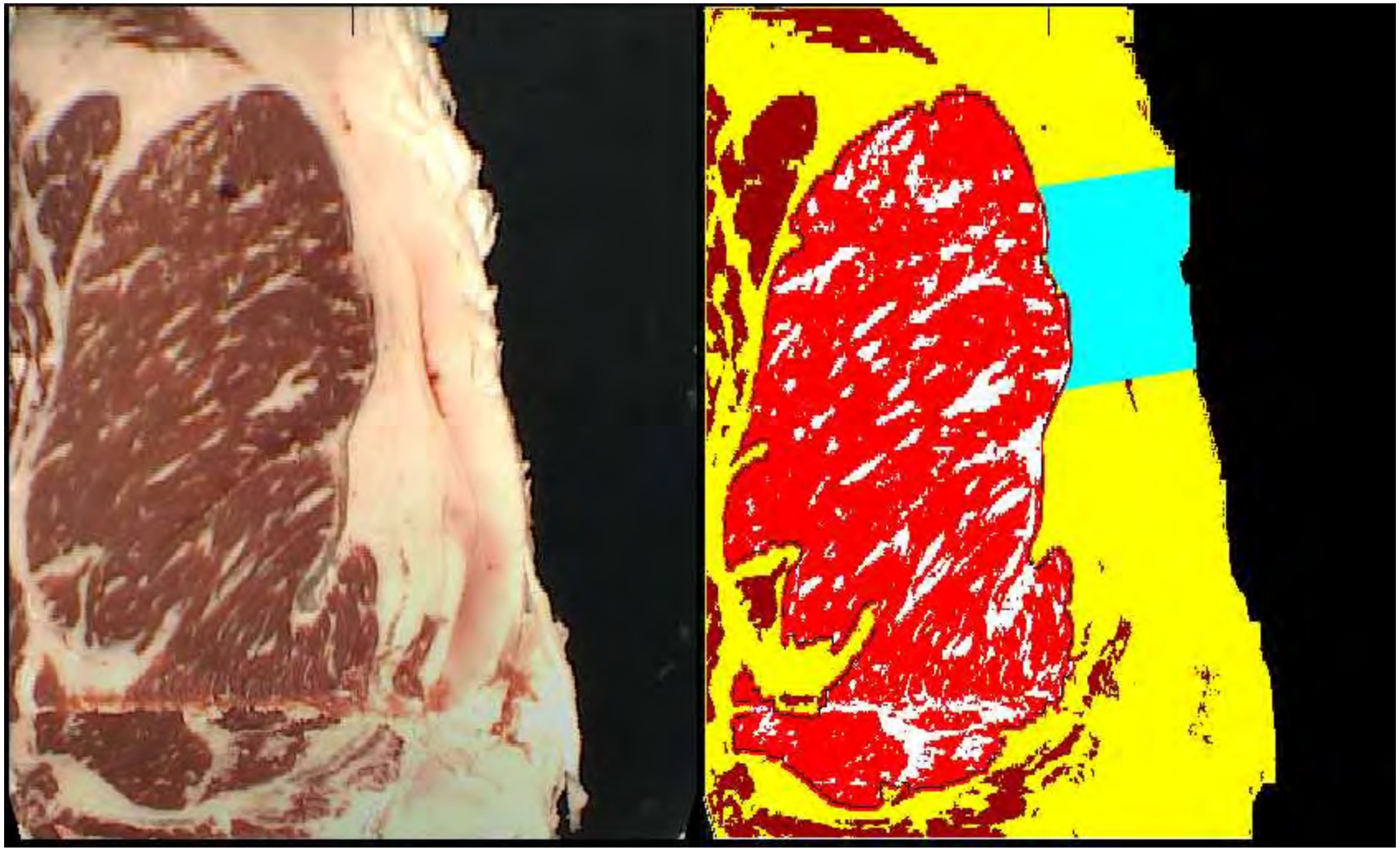
Improper placement of camera nose on the 12th-13th rib cross section. Sharp/clear image defect.

Example # 6



Ribbed between 11th and 12th rib, bone-dust, over traced ribeye, and fat debris influence estimation of fat thickness. Over tracing, debris, improper ribbing, and fat thickness defects.

Example # 7



Bone-dust and knife/saw mark negatively impact instrument marbling prediction. Improper ribbing and debris defects.