



Toolmarks Examination Test No. 17-529 Summary Report

Each sample set consisted of one hose/pipe cutter (Item 1) and two pieces of hose (Items 2 and 3) containing the questioned toolmarks. Participants were requested to determine if the recovered hose cutter had cut either of the questioned pieces of hose. Data were returned from 176 participants and are compiled into the following tables:

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

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

Manufacturer's Information

Each sample set contained one pipe cutter (Item 1) and two sections of hose containing questioned toolmarks (Items 2 and 3). Participants were requested to determine if any of the questioned toolmarks were made by the submitted tool. The Item 2 and Item 3 hose pieces were both cut by the Item 1 pipe cutter. Each questioned piece of hose contained a green painted end to assist examiners in determining which side was not intended for examination.

ITEMS 2 and 3 (IDENTIFICATION MARKS): The Item 2 blue hose was cut by the Item 1 Orbit Poly Pipe Cutter 1 1/4" and packaged into a pre-labeled Item 2 envelope. The Item 3 red hose was cut by the Item 1 Orbit Poly Pipe Cutter 1 1/4" and packaged into a pre-labeled Item 3 envelope. The corresponding pipe cutter was labeled with an Item 1 label and packaged in bubble wrap. Items 1, 2 and 3 were then immediately assembled into the sample pack box as described below. The above process was repeated until all identification toolmarks had been prepared.

SAMPLE PACK ASSEMBLY: The corresponding Item 1 pipe cutter, along with the Item 2 and Item 3 hose were packaged into a pre-labeled sample pack box. An additional 6" section of each hose substrate was included for testing purposes. This process was repeated until the required number of sample packs were produced.

VERIFICATION: Two of the three predistribution laboratories confirmed the expected identification between Items 1, 2 and 3. The remaining predistribution laboratory identified Item 3, but was inconclusive for Item 2 as being produced by the Item 1 pipe cutter and further stated that the inconclusive determination was based on "distortion" of their test cuts (flexibility) and not the Item 2 itself.

In addition to the predistribution laboratories, 10 randomly selected sample sets were examined by a qualified toolmark examiner who also confirmed the expected identification between Items 1, 2 and 3.

Summary Comments

This test was designed to allow participants to assess their proficiency at a toolmark examination involving striated type toolmarks. Each sample set consisted of one hose/pipe cutter (Item 1) and two pieces of hose (Items 2 and 3) containing the questioned toolmarks. Participants were requested to determine if the recovered hose cutter had cut either of the questioned pieces of hose. The Item 2 and Item 3 pieces of hose were cut by the Item 1 hose cutter. [Refer to Manufacturer's Information for preparation details.]

Of the 176 responding participants, 145 (82%) identified the Item 1 hose cutter as having cut the Item 2 and Item 3 pieces of hose. 14 participants either eliminated or were inconclusive for the Item 2 and Item 3 pieces of hose as having been cut by the Item 1 hose cutter. 14 participants eliminated or were inconclusive for Item 2 and identified Item 3 as having been cut by the Item 1 hose cutter. 3 participants identified Item 2 and eliminated Item 3 as having been cut by the Item 1 hose cutter.

Many participants who eliminated both Item 2 and Item 3 stated that they were cut by the same tool, but not by the Item 1 cutter. It should be noted that during production both cuts were made closer to the pivoting end of the blade and not on the forward part of the blade where the hose would naturally sit within the cup in the lower jaw of the cutter. This was done intentionally to reduce the flexibility of the hose, obtain consistent pressure with each cut and increase the challenge level of the test by utilizing a less obvious area of the blade.

Examination Results

Did the suspect's hose cutter (Item 1) produce the questioned toolmarks on either of the submitted pieces of hose (Items 2 or 3)?

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
22F9GU	Yes	Yes	8DTJAR	Yes	Yes
24MU6U	Yes	Yes	8LMW6L	Yes	Yes
2CF9LL	Yes	Yes	8QGLRK	Yes	Yes
2K6UU6	Yes	Yes	8T3HAJ	Yes	Yes
2QXUAL	Yes	Yes	8UECQJ	Yes	Yes
2W4TJQ	Yes	Yes	8WMK2P	Yes	Yes
3372LC	Yes	Yes	94YYJK	Yes	Yes
34F9N6	Yes	Yes	9AP9TH	Yes	Yes
3B3UZX	Yes	Yes	9HFYAJ	Yes	No
3QR77D	Yes	Yes	9UXDGR	Yes	Yes
3XC3BM	Yes	Yes	9V7PR3	Inc	Inc
4322YG	Yes	Yes	9WZDDH	Yes	Yes
43G6T9	Inc	Yes	A6PLBE	Yes	Yes
46Q9MK	Yes	Yes	AFATCP	Yes	Yes
4KJZ9L	Yes	Yes	ANLRY9	Inc	Yes
4N23D7	Yes	Yes	AQPP7U	Yes	Yes
4R6VAP	No	No	AUQTXG	Yes	Yes
4Y4FFR	Yes	Yes	AWFYHE	Yes	Yes
6DJXML	Yes	Yes	B3FYBF	Yes	Yes
6LC77Q	Yes	Yes	B94L4Y	Yes	Yes
6M46KP	Yes	Yes	B9M697	Yes	Yes
6VF9MH	Yes	Yes	BGZDDE	Yes	Yes
7MJTEP	Yes	Yes	BM9KC7	Yes	Yes
7TPNW4	Yes	Yes	BRGZMF	Yes	Yes
8432VJ	Yes	Yes	C6LLLY	Yes	Yes
86WTKB	Yes	Yes	CXZPHA	Yes	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
D2KRAE	Yes	Yes	JMD4BR	Yes	Yes
DFDKUF	Yes	Yes	JPGUH8	Yes	Yes
DR79LA	Yes	Yes	JR7234	No	No
DXDEJZ	Yes	Yes	JRNATJ	Yes	Yes
DYAUUC	Yes	Yes	JY94BB	Yes	Yes
E9BWBE	Yes	Yes	JYQ3K2	Yes	Yes
EHYQRH	Yes	Yes	K2V8E2	Yes	Yes
EN9VGW	Yes	Yes	K6D7RW	Yes	Yes
ENN949	Yes	Yes	KBEN32	Yes	Yes
EUA3Z7	Yes	Yes	KFB86Z	Yes	No
EZ38V	Yes	Yes	KLHT2A	Yes	Yes
EZD8Q4	No	Yes	KY7ZU6	Inc	Yes
F3KPPZ	Yes	Yes	KZJA46	Yes	Yes
FWCHQ9	Yes	Yes	L8D2N4	Yes	Yes
FXPVR	Yes	Yes	LBV276	Yes	Yes
G2NTEW	Inc	Yes	LMQ7E6	Yes	Yes
G948KM	Yes	Yes	LMR8Z4	Yes	Yes
GGFQGR	Yes	Yes	LQMY9Z	Yes	Yes
GVJRE3	No	No	LTUCP2	Yes	Yes
H4AWMU	Yes	Yes	LVJKXH	Yes	Yes
HAVPYT	Inc	Yes	LVJL2N	Yes	Yes
HLMC8A	Inc	Inc	LZFAHV	Yes	Yes
HQGD73	No	No	M24Z6L	Yes	Yes
HQKV99	Yes	Yes	M2JG3Z	Yes	Yes
HQXMY4	Yes	Yes	M4ALV8	No	No
HRUZNH	Inc	Yes	M8RNZR	Yes	Yes
HW7TXV	Yes	Yes	MPTPDP	Yes	Yes
J9GKZV	Yes	Yes	MVFFZK	Yes	Yes
JJT8M2	Yes	Yes	MWPHRB	Yes	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
N4P6DJ	Yes	Yes	UMWKYH	Yes	Yes
N622HN	Yes	Yes	UQKWXN	Yes	Yes
NCLWNX	Yes	Yes	V6XH4Y	Yes	Yes
NHAM99	Yes	Yes	VARLNQ	Yes	Yes
NVXNNE	Yes	Yes	VCFZBF	Inc	Yes
P3CUXQ	Yes	Yes	VCGT9M	Yes	Yes
PGTPC3	Inc	Yes	VMYEEH	Yes	Yes
PUUNYY	No	No	VP33ZY	No	No
PY92ZL	Yes	Yes	WBJ3HY	No	Yes
Q42KLG	Yes	Yes	WCBX68	Yes	Yes
QKM4F4	No	No	WKLCTV	No	No
QMTN44	Yes	Yes	WPY3BJ	Yes	Yes
QYPTC4	Yes	Yes	WV449R	Yes	Yes
R26QWC	Yes	Yes	WVLRVT	Inc	Yes
REVD9Y	Inc	Yes	WXWVKX	Yes	Yes
RK4K8P	Yes	Yes	X7GKGP	No	No
RRZCG6	No	No	XD3DUA	Yes	Yes
RTCCEY	Yes	Yes	XG4CBU	Yes	Yes
RUPNAJ	Inc	Yes	XLVP7Q	Yes	Yes
RY4JUM	Yes	Yes	Y92PTT	Yes	Yes
T23AKY	Yes	Yes	Y978VX	Yes	Yes
T4TDD7	Yes	Yes	YDZ76M	Yes	Yes
TTVCWV	Yes	Yes	YL9HHK	Yes	Yes
TX6QHZ	Yes	Yes	YMKC3Q	Yes	Yes
TYFHPV	Yes	Yes	YR3E8B	Yes	Yes
U478PZ	Yes	Yes	YRDE46	Yes	Yes
UAFHLZ	Yes	Yes	YUKWZF	Yes	Yes
UC37YL	Yes	Yes	YX4TQQ	Yes	Yes
UHTEQ8	Yes	Yes	YYDVGW	Yes	Yes

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
Z8NKRA	Yes	Yes			
Z9ENGA	Yes	Yes			
ZGD7ZT	Inc	Yes			
ZL6F7K	Yes	No			
ZNDP3N	Yes	Yes			
ZRUR89	No	No			
ZXJALJ	Yes	Yes			
ZZ6ETG	Yes	Yes			

Response Summary			Total Participants: 176	
<i>Did the suspect's hose cutter (Item 1) produce the questioned toolmarks on either of the submitted pieces of hose (Items 2 or 3)?</i>				
Responses		<u>ITEM 2</u>	<u>ITEM 3</u>	
	Yes	148 (84.1%)	159 (90.3%)	
	No	14 (8.0%)	15 (8.5%)	
	Inc	14 (8.0%)	2 (1.1%)	

Conclusions

TABLE 2

WebCode	Conclusions
22F9GU	Exhibit 1 is an Orbit brand hose cutter having a cutting surface that measures approximately 1 7/8" in length. Exhibits 2 and 3 are cut sections of hose each having a striated toolmark on one end. The striated toolmarks observed are indicative of a single blade cutting tool that employs a slicing action. The striated toolmarks on Exhibits 2 and 3 were microscopically compared to each other. Based on an agreement of class characteristics and sufficient agreement of individual characteristics, Exhibits 2 and 3 were cut by the same tool. Test toolmarks were made using Exhibit 1 and the red and blue exemplar hose provided by the test provider. Five test toolmarks were made and sequentially labeled as Exhibits 1.T1 - 1.T5. Multiple tests were made in order to demonstrate the reproducibility of both sides of the toolworking surface of Exhibit 1. A test toolmark (Exhibit 1.T5) was microscopically compared to Exhibits 2 and 3. Based on an agreement of class characteristics and sufficient agreement of individual characteristics, Exhibits 2 and 3 were cut by Exhibit 1.
24MU6U	As a result of the comparison between marks in test cuts using item 1, and the marks present in the cut ends of items 2 and 3, it was established that the cutter of item 1 had cut both items 2 and 3.
2CF9LL	Toolmarks present on the Item 2 and Item 3 tubing were identified as having been produced by the Item 1 tube cutter.
2K6UU6	The findings of the comparison between Item 1, Item 2 and Item 3 are extremely more probable if Item 2 and Item 3 were cut by hose cutter Item 1 than if Item 2 and Item 3 were cut by another (hose) cutter.
2QXUAL	The samples test produced by the hose cutter recovered from suspect's vehicle (Item 1) and the first cut piece of hose (Item 2) have an agreement of a combination of individual characteristics and all discernible class characteristics where the extent of agreement exceeds that which can occur in the comparison of tool marks made by different hose cutters and is consistent with the agreement demonstrated by tool marks known have to been produced by the same hose cutter . The samples test produced by the hose cutter recovered from suspect's vehicle (Item 1) and the second cut piece of hose (Item 3) have an agreement of a combination of individual characteristics and all discernible class characteristics where the extent of agreement exceeds that which can occur in the comparison of tool marks made by different hose cutters and is consistent with the agreement demonstrated by tool marks known have to been produced by the same hose cutter .
2W4TJQ	The item 2 and item 3 questioned toolmarks were compared to the test toolmarks produced using the item 1 hose cutter. The item 2 and item 3 questioned toolmarks made using the item 1 hose cutter.
3372LC	The Item 01-02 blue hose and the Item 01-03 red hose were identified as having been cut by the Item 01-01 Orbit hose cutter.
34F9N6	Tool marks observed on the two submitted pieces of cut tubing (Items 2 and 3) are identified as having been produced by the submitted cutter (Item 1).
3B3UZX	The cut end of each of the hoses in item 2 and item 3 was made by the submitted hose cutter in item 1.
3QR77D	The submitted hose cutter, Item 1, cut the two submitted hoses, Items 2 and 3.
3XC3BM	7. I examined the Blue and Red hose pieces (Items 2 and 3) mentioned in 3.2 and 3.3 as well as the test pieces (cut by the hose cutter Item 1) mentioned in 7. using a comparison microscope and found: 7.1 The marks on the hose pieces mentioned were produced by the hose cutter mentioned in 3.1.
4322YG	Comparing Scratch(Item2 & Item3) : Scratch is matched. Comparing Scratch(Item2 & Blue sample) : Scratch is matched. Comparing Scratch(Item3 & Red sample) : Scratch is matched. Scratch toolmarks of Item2 & Item3 are produced by Item1.

TABLE 2

WebCode	Conclusions
43G6T9	3. On 2017-10-27 during the performance of my official duties I received a sealed evidence bag with number PA4001476930 from Case Administration of the Ballistics Section, containing the following exhibits: 3.1 One (1) hose cutter tool marked by me "513709/17 1". 3.2 One (1) blue piece of hose marked by me "513709/17 2". 3.3 One (1) red piece of hose marked by me "513709/17 3". 3.4 Two (2) pieces of hoses for test purposes (blue and red). 4. The intention and scope of this forensic examination comprise the following: 4.1 The examination of tools and toolmark related materials. 4.2 Microscopic individualization of toolmarks. 5. I examined the pieces of hose mentioned in paragraphs 3.2 and 3.3 and for test purposes replications were made from the pieces of hose mentioned in paragraph 3.4 and marked as 709T1 and 709T2 with tool mentioned in paragraph 3.1. 6. I compared the individual and class characteristics markings on the piece of hoses mentioned in paragraphs 3.2, 3.3 and 5 using a comparison microscope and found: 6.1 The marks on the piece of hose mentioned in paragraph 3.3 were produced by the tool mentioned in paragraph 3.1 6.2 It cannot be determined if the marks on the pieces of hose mentioned in paragraphs 3.2 and 3.3 were produced or were not produced by the same tool. 6.3 It cannot be determined if the marks on the piece of hose mentioned in paragraph 3.2 were produced or were not produced by the tool mentioned in paragraph 3.1.
46Q9MK	The hose cutter Item 1 produced the questioned toolmarks on Items 2 und 3.
4KJZ9L	The hose cutter recovered from the suspects' vehicle was used to cut the two pieces of hose.
4N23D7	On the pieces of hoses (Items 2 and 3) there are striation marks which have been produced by the same tool. The toolmarks on the items 2 and 3 correspond in individual characteristics with the test mark made with the hose cutter of the item 1. The toolmarks on the items 2 and 3 are left by the hose cutter of the item 1.
4R6VAP	Item 1 is a functional hose cutter. Items 2 and 3 do not possess similar class characteristics as those exhibited by the toolmarks created by the hose cutter, Item 1. There is also lack of matching individual microscopic details. The cut pieces of hose, Items 2 and 3 were eliminated as having been cut by the hose cutter, Item 1.
4Y4FFR	EXAMINATION/ANALYSIS AND INTERPRETATION OF RESULTS: Exhibit 2 and 3 consist of two pieces of cut hoses that were microscopically examined for the presence of toolmarks, and toolmarks of value for comparison were found. A microscopic comparison was conducted between Exhibits 2 and 3 and test cuts from Exhibit 1. There is agreement of all discernible class characteristics and sufficient agreement of individual characteristic to determine that the Exhibit 2 and 3 hoses were cut by the Exhibit 1 hose cutter.
6DJXML	1. Exhibit 1 is an Orbit brand hose cutter, designed as a single bladed cutting tool. Exhibit 1.1 (test standards) was created for comparison purposes and is being returned along with Exhibit 1. 2. Exhibit 2 and Exhibit 3 (two cut hoses) were visually and microscopically compared to test standards from Exhibit 1. a. Exhibit 2 was identified as having been cut by Exhibit 1 (tube cutter). b. Exhibit 3 was identified as having been cut by Exhibit 1 (tube cutter).
6LC77Q	I conducted a microscopic comparison examination of casts made from the cut ends of submitted items 2 & 3 with casts from test cuts made with Item 1. Both Items 2 & 3 tool marks were identified as having been made by exhibited pipe cutter tool Item 1.
6M46KP	Test marks obtained from item #1 were microscopically compared to the tool mark impressions on items #2 and #3. Item #1 was identified as having damaged items #2 and #3 based upon sufficient agreement of individual characteristics (test cut #3, red tubing).
6VF9MH	Both Item 2 and Item 3 are produced by Item 1.
7MJTEP	The cut marks on item 2 and item 3 (cut pieces of hose) have been made by item 1 (Hose cutter recovered from suspect's vehicle). Identification

TABLE 2

WebCode	Conclusions
7TPNW4	#1: A sealed white box with a white label marked "2017 CTS Forensic Testing Program; Test No. 17-529; TOOLMARKS EXAMINATION; Sample Pack: T2" containing the following: #1-1: A red and black "Orbit" hose cutter. #1-2: A cut section of blue hose in a tape sealed manila envelope with a white label marked "Test No. 17-529; Item 2". #1-3: A cut section of red hose in a tape sealed manila envelope with a white label marked "Test No. 17-529; Item 3". FINDINGS & OPINIONS: (The findings and opinions below are based upon standard firearms identification and examination procedures.) Examination of the hose cutter, item #1-1, revealed the presence of red and green debris on the base of the blade. This debris was collected and retained prior to the production of test cuts and will be returned with the evidence. Microscopic comparison of the cuts on the two (2) supply hoses, items #1-2 and #1-3, with test cuts made on the supplied hoses with the submitted hose cutter revealed matching individual striated marks. The two (2) supply hoses were positively identified as being cut by item #1-1.
8432VJ	1) Exhibit 1 (Orbit brand hose cutter) is designed to be used as a single blade cutting tool. Exhibit 1.1 (Test Marks) was created for comparison and is being returned with Exhibit 1. 2) Exhibits 2 (Blue colored hose) and 3 (Red colored hose) were visually examined and microscopically compared to test toolmarks from Exhibit 1. a) The Exhibits 2 and 3 hoses were identified as having been cut by the Exhibit 1 hose cutter.
86WTKB	Item 2 and item 3 have been cut by item 1.
8DTJAR	The results of the examination extremely strongly support that the toolmarks on Item 2 were produced by Item 1 (Level +4). The results of the examination extremely strongly support that the toolmarks on Item 3 were produced by Item 1 (Level +4).
8LMW6L	Toolmarks observed in both of the hose pieces labeled as Item 2 and Item 3 were produced by the submitted hose cutter labeled as Item 1.
8QGLRK	1. Exhibit 1 was examined and determined to be a single blade opposed jaw tool. Exhibit 1.1 (test cuts) was created for comparison and will be returned with Exhibit 2. 2. Exhibit 2 and 3 are both pieces of but plastic hose and were visually and microscopically compared to each other and Exhibit 1. 3. Exhibit 1 was used to cut both Exhibits 2 and 3.
8T3HAJ	Items 2 and 3 were identified as having been cut by the Item 1 hose cutter.
8UECQJ	Item 1 is an Orbit brand hose cutter. Item 2 is piece of blue rubber tubing that bears slicing toolmarks on one end. Item 3 is piece of red rubber tubing that bears slicing toolmarks on one end. Toolmarks present on Item 2 and Item 3 were identified as having been produced by the Item 1 hose cutter.
8WMK2P	(a) A comparative microscopic examination between the cut on the exhibit cut section of blue hose (Item 2), and tests cut from supplied blue hose using the exhibit hose cutter (Item 1), revealed that the exhibit cut section of blue hose (Item 2) was cut by the exhibit hose cutter (Item 1). (b) A comparative microscopic examination between the cut on the exhibit cut section of red hose (Item 3), and tests cut from the supplied red hose using the exhibit hose cutter (Item 1), revealed that the exhibit cut section of red hose (Item 3) was cut by the exhibit hose cutter (Item 1).
94YYJK	Items 2 and 3 were cut by Item 1. There was sufficient unique surface contours in agreement for an identification.
9AP9TH	Lab Item 1: One Orbit brand tubing cutter. Lab Item 1.1: Test toolmarks obtained from Lab Item 1. Test toolmarks created using the tubing cutter, Lab Item 1, were microscopically compared to the toolmarks exhibited on the cut portions of tubing, Lab Items 2 and 3. Lab Item 2: One cut portion of blue tubing. The toolmark displayed on the cut portion of tubing, Lab Item 2, was created by the tubing cutter, Lab Item 1, based on microscopic comparison and agreement of discernible class characteristics and sufficient matching individual detail. Lab Item 3: One cut portion of red tubing. The toolmark displayed on the cut portion of tubing, Lab Item 3, was created by the tubing cutter, Lab Item

TABLE 2

WebCode	Conclusions
	1, based on microscopic comparison and agreement of discernible class characteristics and sufficient matching individual detail.
9HFYAJ	THE TWO SIDES OF THE BLADE OF THE CUTTER HAS CALLED AS SIDE A AND SIDE B. THE ITEM N° 2 HAS BEEN CUT WITH THE SIDE A OF THE CUTTER.
9UXDGR	Tool Mark Analysis: Methodology - Comparison Microscopy: Test marks were made with Item 1, the tubing/hose cutter, using the submitted standard testing media. The tool marks on Items 2 and 3, the blue and red hose, were made with Item 1, the tubing/hose cutter, based upon corresponding class and individual microscopic characteristics. Item 1A, the test marks, was sealed in a manila envelope and will be retained in the laboratory for possible future analysis.
9V7PR3	Toolmarks observed on items 2 and 3 are not identified or eliminated (inconclusive result) as having been produced by item 1 (submitted tubing cutter). The individual characteristics do not display agreement. Toolmarks observed on items 2 and 3 are identified as having been produced by the same tool.
9WZDDH	In my opinion the hose cutter, Item 1, made the crime cuts in the blue hose, Item 2, and the red hose, Item 3. This is a conclusive finding.
A6PLBE	1. The marks on the red piece of PVC tubing (Item 3) were produced by the hose cutter. 2. The marks on the blue piece of PVC tubing (Item 2) were produced by the hose cutter.
AFATCP	Tool Mark Analysis: Methodology - Comparison Microscopy: The tool mark on Item 2, the hose, was made using Item 1, the hose cutter, based upon corresponding class and individual microscopic characteristics. The tool mark on Item 3, the hose, was made using Item 1, the hose cutter, based upon corresponding class and individual microscopic characteristics.
ANLRY9	The item 2 piece of hose bears similar but insufficient microscopic marks to permit a positive identification to the item 1 hose cutter. The item 3 piece of hose was cut by the item 1 hose cutter.
AQPP7U	In the result of examination we conclude that the both questioned toolmarks at item 2 and 3 were produced by the suspect's hose cutter (item 1).
AUQTXG	MICROSCOPIC COMPARISON EXAMINATIONS OF THE EVIDENCE BLUE HOSE (ITEM 2) Q1 AND THE RED HOSE (ITEM 3) Q2 AND TEST HOSE PIECES FROM THE HOSE CUTTER K1 HAVE REVEALED THAT SUFFICIENT AGREEMENT OF INDIVIDUAL CHARACTERISTICS EXISTS TO IDENTIFY THE BLUE HOSE Q1 AND THE RED HOSE Q2 AS HAVING BEEN CUT WITH THE HOSE CUTTER, K1. Sufficient agreement is related to the significant duplication of random toolmarks as evidence by a pattern or combination of patterns of surface contours. "Sufficient agreement" exists between two toolmarks means that the agreement is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility.
AWFYHE	Item 1 is an Orbit brand hose cutter that uses a slicing type action to cut. Item 2 and Item 3 are pieces of hose that were cut with a tool using a slicing type action. The Item 2 and Item 3 pieces of hose were identified as having been cut by the Item 1 hose cutter.
B3FYBF	2.1 I examined the hoses marked Item 2 and Item 3 using a comparison microscope and found microscopic comparable marks which can possibly be utilized for individualization. 2.2 I examined the hose cutter marked Item 1 and made replications for test purposes and marked the tests Test 1 to Test 4. 2.3 I compared the individual and class characteristic markings on the Item 2 to Item 3 and tests marked Tests 1 to 4 using a comparison microscope and found: 2.3.1 The cut marks on the hose marked Item 2 and Item 3 were produced by the hose cutter marked Item 1.
B94L4Y	Tool marks observed on the submitted tubing (Items 2 and 3) are identified as having been produced by the submitted tubing cutter (Item 1).

TABLE 2

WebCode	Conclusions
B9M697	Item #1 (Hose cutter recovered from suspect's vehicle), Item #2 (First cut piece of hose / blue) and Item #3 (Second cut piece of hose / red) were examined and microscopically compared on 10/06/2017. Based on agreement of all discernable class characteristics and sufficient agreement of individual characteristics, Item #2 (First cut piece of hose / blue) and Item #3 (Second cut piece of hose / red) were positively identified as having been cut by Item #1 (Hose cutter recovered from suspect's vehicle).
BGZDDE	I compared the individual and class characteristic markings on the hose cutter (item 1) and cut hoses (items 2 and 3) using a comparison microscope and found: The marks on the blue and red hose pipes (items 2 and 3) were produced by the hose cutter mentioned in paragraph (item 1).
BM9KC7	Examination of the pipe cutter in Item 1 revealed it to be a single blade cutting tool in normal operating condition. The hoses in Items 2 and 3 were microscopically examined in conjunction with test hoses cut with Item 1 pipe cutter. Based on these comparative examinations it was determined that the hoses in Items 2 and 3 were cut by Item 1 pipe cutter.
BRGZMF	Identification: Agreement of all discernible class characteristics and sufficient agreement of individual characteristics to determine Item 2 and Item 3 were cut by Item 1.
C6LLLY	Item 2 and Item 3 have been cut by the hose cutter Item 1.
CXZPHA	Item 2 and Item 3 were cut by Item 1. This lab made test marks. Blue hose and Red hose cut by item 1. And compare test marks with each items(Item 2, Item 3). Item 2 and Item 3 toolmarks are the same with testmarks, matched characteristic pattern.
D2KRAE	I microscopically compared the test marks made using the submitted pipe cutter (Item 001-1) to the marks exhibited on the submitted piece of blue plastic tubing, Item 001-2. I observed sufficient agreement of individualistic characteristics to conclude that the blue plastic tubing, Item 001-2, was cut with the submitted pipe cutter, Item 001-1. I microscopically compared the test marks made using the submitted pipe cutter (Item 001-1) to the marks exhibited on the submitted piece of red plastic tubing, Item 001-3. I observed sufficient agreement of individualistic characteristics to conclude that the red plastic tubing, Item 001-3, was cut with the submitted pipe cutter, Item 001-1.
DFDKUF	Item 1 - Orbit brand hose cutter (1). Item 2 - Blue cut hose (2). Item 3 - Red cut hose (3). The submitted specimen marked Item 1 was examined and identified as a hose cutter. The submitted specimens marked Item 2 and Item 3 were examined and identified as pieces of cut hose exhibiting toolmarks on one end. Test toolmarks were generated using Item 1 and microscopically compared with toolmarks exhibited on Item 2 and Item 3. As a result of microscopic examination, Item 1 was identified as having created the toolmarks exhibited on Item 2 and Item 3.
DR79LA	Test toolmarks produced by Item 001-01 were microscopically examined in conjunction with toolmarks present on the cut pieces of hose in Items 001-02 and 001-03. Based on these comparative examinations and observed class and individual characteristics, the hose cutters in Item 001-01 were identified as having produced the toolmarks present on Items 001-02 and 001-03. Items 001-04 and 001-05 were used to produce test toolmarks from the submitted Hose Cutter in Item 001-01.
DXDEJZ	Items #2(Blue Hose) and #3 (Red Hose) identified as having been cut by Item #1 (Hose Cutter).
DYAUUC	The toolmarks on Item 2 and Item 3 were identified as having been made by the Item 1 tool.
E9BWBE	Based on the results obtained (according to stage 1 of the assessment scale) that the toolmarks on the hose pieces, items 2 and 3, have been caused by the hose cutter, item 1.
EHYQRH	I compared the marks present on the cut surfaces of the two pieces of hose (items 2 and 3) to test cuts made using the hose cutter (item 1). An excellent correspondence of microscopic detail was found

TABLE 2

WebCode	Conclusions
	between test cuts made using the hose cutter (item 1) and the cut surface on the blue piece of hose (item 2) and the cut surface on the red piece of hose (item 3). In my opinion, the hose cutter has been used to cut both pieces of hose.
EN9VGW	I used the hose cutter (Item 1) and cut tests with it from the hoses sent (exhibits). The exhibits Item 2 & Item 3 were cut with the hose cutter and is positive with the tests that was cut. (striation marks correspond.)
ENN949	The first (blue) and the second (red) piece of the hose were cut by a chisel secured in a suspect car.
EUA3Z7	The questioned toolmarks on items 2 and 3 were produced by item 1.
EZ38WV	The cut sections of tubing in items #2 and #3 were microscopically compared to test cuts made using the hose cutters of item #1 with the following conclusions: The hoses of items #2 and #3 were identified as having been cut by the cutters of #1.
EZD8Q4	The toolmarks on the submitted piece of hose (Item 3/ red) originate from the hose cutter (Item 1). The toolmarks on the piece of hose (Item 2/blue) were not produced by the hose cutter (Item 1). They might originate from a similar type of hose cutter.
F3KPPZ	The Item 01-02 blue hose segment and the Item 01-03 red hose segment were each identified as having been cut by the Item 01-01 Orbit brand hose cutter.
FWCHQ9	I compared the individual and class characteristic markings on the hoses (item 2 & 3) and test hoses, using a comparison microscope and found: The marks on the hoses (items 2 & 3) were produced by the hose cutter(item 1).
FXPVRY	1. Examinations showed that the tool marks present on the Item 2, cut hose, were made by the Item 1 tubing cutter. 2. Examinations showed that the tool marks present on the Item 3, cut hose, were made by the Item 1 tubing cutter.
G2NTEW	The cut ends of the submitted pieces of hose (Items 2 & 3) were microscopically compared to test cuts made by the submitted hose cutter (Item 1) with the following results: Item 2 could not be identified or eliminated as having been cut by Item 1. Item 3 was identified as having been cut by Item 1.
G948KM	The suspect's hose cutter was used to cut the heating oil line both piece one (1) first hose (blue) and second piece of hose (red). There is enough sufficient toolmarks transferred from a tool to exhibits which are hose cutter (tool) to two pieces of hose.
GGFQGR	The Item 2 and Item 3 cut pieces of hose were cut by the Item 1 hose cutter. These identifications are based on sufficient agreement of the combination of individual characteristics and all discernible class characteristics.
GVJRE3	[No Conclusions Reported.]
H4AWMU	Examinations showed that the tool marks on Item 2 were made by Item 1. Examinations showed that the tool marks on Item 3 were made by Item 1.
HAVPYT	Tool marks observed on Item 3 (portion of a 1 inch diameter red hose) are identified as having been produced by Item 1 (Orbit hose cutter).
HLMC8A	The two pieces of cut hose (items 2 and 3) exhibit matching tool marks with microscopic agreement that exceeds the quality and quantity of marks if they were from different tools. Therefore, these two pieces were likely cut by the same tool. Test cuts made by the submitted cutter (item 1) could be microscopically matched to each other and exhibited good reproducibility. The submitted tool (item 1) could not be matched to the recovered tubing (items 2 and 3; however, the unknowns (items 2 and 3) have similar class character as observed on the cutting tool (item 1). Therefore the result is

TABLE 2

WebCode	Conclusions
	inconclusive.
HQGD73	Upon comparison, I found that the characteristic toolmarks on "Item 2" and "Item 3" were not similar with those on the test cut mark made by Item 1 (hose cutter). Therefore, I am of the opinion that the toolmarks on "Item 2" and "Item 3" were not made by Item 1.
HQKV99	Item2 and Item3 contained the same class characteristics, and is the same from the hose cutter that was designated as Item1
HQXMY4	In my opinion: - 1. The hose cutter recovered from the suspect's vehicle (item 1) was used to cut the first cut piece of hose (item 2). Conclusive Association 2. The hose cutter recovered from the suspect's vehicle (item 1) was used to cut the second cut piece of hose (item 3). Conclusive Association
HRUZNH	The Item 2 hose could neither be identified nor eliminated as having been cut with the Item 1 hose cutter. The Item 3 hose was cut with the Item 1 hose cutter.
HW7TXV	Item: 1 Hose cutter recovered from suspect's vehicle. RESULTS: Item 1 was physically and microscopically examined. Item 1 was used to produce test specimens. Item: 1.1 Test specimens produced by Item 1 using Laboratory supplied test media. RESULTS: Test specimens were packaged for return with the other evidence. Item: 2 First cut piece of hose (blue). Item: 3 Second cut piece of hose (red). RESULTS: Items 2 and 3 were physically and microscopically examined. The toolmark areas of Items 2 and 3 were microscopically compared with each other and with test toolmarks produced by the Item 1 hose cutter. Matching individual identifying characteristics were found, and it was concluded that Items 2 and 3 were both cut by the Item 1 hose cutter.
J9GKZV	Examinations showed that Item 1 cut Item 2 (blue). Examinations showed that Item 1 cut Item 3 (red).
JJT8M2	Item 2 and Item 3 are produced by Item 1
JMD4BR	I examined the hose mentioned in 3.2 and 3.3 using a comparison microscope and found microscopic comparable marks which can possibly be utilized for individualization. I examined the hose cutter mentioned in 3.1 and cut test marked T1L-T1R from the blue hose marked by me A3, T2L-T2R from the red hose marked by me A4 for comparison purposes. I compared the individual and class characteristic markings on the hose and tests mentioned in 3.2, 3.3 and 6 using a comparison microscope and found marks on the hoses mentioned in 3.2 and 3.3 marked T1L and T2L were produced by the hose cutter mentioned in 3.1.
JPGUH8	Item 1 is an Orbit hose cutter that uses a slicing action. Toolmarks present on the Item 2 hose and the Item 3 hose were identified as having been produced by the Item 1 hose cutter.
JR7234	Upon comparison, I found that the characteristics toolmarks Item 2 (First cut piece of hose (blue)) and Item 3 (Second cut piece of hose (red)) to be different with the characteristics toolmarks made by the Item 1 (Hose cutter recovered from suspect's vehicle). Hence, I am of the opinion that the toolmarks on Item 2 and Item 3 were not made by the Item 1.
JRNATJ	The marks on the hose pieces marked Item 2 and Item 3 were produced by the suspect's hose cutter marked Item 1.
JY94BB	The striated toolmark on Item 2 was found upon microscopic comparison to have been caused by the blade of the tube cutter in Item 1. This identification was based on an agreement of both class and individual characteristics. The striated toolmark on Item 3 was found upon microscopic comparison to have been caused by the blade of the tube cutter in Item 1. This identification was based on an agreement of both class and individual characteristics.
JYQ3K2	The toolmarks on both pieces of hose (item 2 and 3) are produced by the hose cutter (item 1).
K2V8E2	The results speak with certainty that the toolmarks on the blue piece of hose (Item 2) were produced by

TABLE 2

WebCode	Conclusions
	the suspect's hose cutter (Item 1). The results speak with certainty that the toolmarks on the red piece of hose (Item 3) were produced by the suspect's hose cutter (Item 1).
K6D7RW	Examination of Item 1 revealed it to be a single blade cutting tool. Test toolmarks from Item 1 were microscopically examined with the toolmarks present on Item 2 and Item 3. Based on these comparative examinations, it was determined that the toolmarks present on Item 2 and Item 3 had been produced by Item 1.
KBEN32	Item 1 is an Orbit cutter that was identified as having cut the Item 2 and Item 3 hose.
KFB86Z	On examination, I found that: (i) The characteristics marks on Item 2 and the characteristics mark on the hose produced by hose cutter Item 1 to be similar. Therefore, I am of the opinion that the marks on Item 2 was produced by the hose cutter Item 1. (ii) The characteristics marks on Item 3 and the characteristics mark on the hose produced by hose cutter Item 1 to be dissimilar. Therefore, I am of the opinion that the marks on Item 3 was not produced by the hose cutter Item 1.
KLHT2A	Exhibit 1 is an Orbit brand hose cutter. Using Exhibit 1, multiple test cuts were created using hose supplied as exemplar material. The test cuts were designated 1.T1 – 1.T7. Examination of Exhibits 2 and 3 disclosed toolmarks on the cut end of each hose, with class characteristics consistent with a single blade slicing/cutting type tool. The toolmarks on Exhibits 2 and 3 were compared to test toolmarks from the Exhibit 1 hose cutter. Visual examination and microscopic comparison disclosed sufficient agreement of class and individual characteristics to conclude that Exhibits 2 and 3 were cut by the Exhibit 1 hose cutter.
KY7ZU6	Item 3 was cut by item 1. It cannot be determined if item 2 was or was not cut by item 1
KZJA46	Item 1, 2, & 3 The sections of hose were both identified as having been cut by the hose cutter.
L8D2N4	Items 2 and 3 were identified as having been cut by the Item 1 hose cutter.
LBV276	Item 1 is an Orbit brand hose cutter that uses a slicing/shearing type action. The Item 1 hose cutter was identified as having created the toolmarks present on the Item 2 and Item 3 hoses.
LMQ7E6	1. I examined Item 2 and Item 3 using a comparison microscope and found microscopic comparable marks which can possibly be utilized for individualization. 2. I examined the hose cutter marked Item 1 and made replications for test purposes and marked the tests T1 and T2. 3. I compared the individual and class characteristic markings on the exhibits and tests marked Item 2, Item 3, T1 and T2 using a comparison microscope and found: 3.1 The cut marks on the hoses marked Item 2 and Item 3 were produced by the hose cutter marked Item 1.
LMR8Z4	Item 2: The toolmark on the Item 2 hose was made by the Item 1 hose cutter. Item 3: The toolmark on the Item 3 hose was made by the Item 1 hose cutter.
LQMY9Z	Examination and microscopic comparison of the submitted cut hose sections (Items 2-3) with tests cuts created using the submitted pipe cutter (Item 1) revealed sufficient microscopic detail to conclude that the submitted tubing sections (Items 2-3) were cut by the submitted pipe cutter (Item 1).
LTUCP2	The questioned toolmarks on Item 2 and Item 3 were made by the tool Item 1.
LVJKXH	The tool marks on Items 2 and 3 were made with Item 1. Test tool marks were made with Item 1 using submitted rubber hose. This set of test marks are designated Item TF1.
LVJL2N	A microscopic examination and comparison of test pieces of cut hose produced by item #1.1, the submitted hose cutter, to item #1.2 and item #1.3, displayed sufficient agreement of individual characteristics to conclude that both pieces of submitted cut hose had been cut by item #1.1.

TABLE 2

WebCode	Conclusions
LZFAHV	There are sufficient individual markings present to identify item 1 (hose cutter) as the tool used to damage items 2 and 3 (hoses).
M24Z6L	The piece of cut blue hose (2) and the piece of cut red hose (3) were cut by the Orbit brand 1 ¼ Inch Plastic Pipe and Tube Cutter (1).
M2JG3Z	Test tool marks produced from the Orbit plastic pipe cutting tool in Item 001-01 were microscopically examined in conjunction with the tool marks present on Items 001-02 and 001-03. Based on these comparative examinations, the following was determined: The pipe cutting tool in item 001-01 was identified as having produced the tool marks on the pieces of plastic tubing material in items 001-02 and 001-03.
M4ALV8	Items #2 and #3 were not cut by the Item #1 cutter.
M8RNZR	Item #2(blue hose) and Item #3(red hose) Identified as having been cut by Item #1(hose cutter).
MPTPDP	Test toolmarks produced by the hose cutter in Item 1 were microscopically examined in conjunction with the toolmarks present on Items 2 and 3. Based on these comparative examinations, it was determined that Items 2 and 3 had been cut by Item 1.
MVFFZK	Items 2 and 3 have been compared microscopically with tests made with Item 1. Based on the observed agreement of their class characteristics and sufficient agreement of their individual characteristics, Items 2 and 3 are identified as having been cut by Item 1.
MWPHRB	Tool marks observed on the cut ends of the sections of hose (Item 2 and Item 3) were microscopically compared to test tool marks made using the Orbit hose cutter (Item 1) with POSITIVE RESULTS. The tool marks on the cuts were identified as having been made with the Orbit hose cutter due to the sufficient agreement of individual characteristics observed between the evidence and test tool marks.
N4P6DJ	Item 2 and 3 were identified as having been cut by Item 1 based on the agreement of individual and class characteristics.
N622HN	1) Examinations showed Item 2 and Item 3 were cut by Item 1.
NCLWNX	The questioned cuts on Items 2 and 3 were compared to tests produced by the Item 1 hose cutter. Both questioned cuts on Items 2 and 3 were produced by the Item 1 cutters.
NHAM99	An experimental sample of blue hose was performed by Item 1 and it matched with Item 2. An experimental sample of Red hose was performed by Item 1 and it matched with Item 3.
NVXNNE	The hose cutter recovered was used to cut the first & second pieces of hose. There is sufficient marks transferred from the tool to the pieces of hose.
P3CUXQ	Examination of Items #2 and #3 revealed the presence of toolmarks (cuts) that had been produced by a single-bladed cutting tool. Test cuts from the hose cutter in Item #1 were microscopically examined in conjunction with the toolmarks present on Items #2 and #3. Based on these comparative examinations and observed class and individual characteristics, it was determined that Items #2 and #3 had both been cut by Item #1.
PGTPC3	CONCLUSIONS: MICROSCOPIC COMPARISONS BETWEEN CUT PIECE OF BLUE HOSE Q1 (ITEM 2), CUT PIECE OF RED HOSE Q2 (ITEM 3), AND TEST CUTS FROM SPRING-LOADED HOSE CUTTER K1 (ITEM 1), REVEAL THAT SUFFICIENT AGREEMENT OF INDIVIDUAL CHARACTERISTICS EXISTS TO IDENTIFY THE FOLLOWING; THE ONE CUT PIECE OF RED HOSE, MARKED Q2 (ITEM 3) WAS CUT WITH SUBMITTED HOSE CUTTER K1 (ITEM 1). THOUGH SIMILAR CLASS CHARACTERISTICS EXISTS, CUT BLUE HOSE Q1 (ITEM 2), CANNOT BE IDENTIFIED OR ELIMINATED AS HAVING BEEN CUT WITH SUBMITTED HOSE CUTTER K1 (ITEM 1), DUE TO AN INSUFFICIENT AGREEMENT OF MICROSCOPIC MARKS PRESENT.

TABLE 2

WebCode	Conclusions
PUUNYY	Observed toolmarks on Item 2 and Item 3 have been produced by the same tool. Observed toolmarks on Item 2 and Item 3 have not been produced by Item 1.
PY92ZL	The marks on the pieces of hose marked 531465/17 Item 2 & Item 3 were produced by the Hose cutter marked 531465/17 Item 1.
Q42KLG	Tool marks observed on the submitted blue rubber hose (Item 2) and the red rubber hose (Item 3) are identified as having been produced by the submitted hose cutter (Item 1).
QKM4F4	1. The toolmarks present on the pieces of hoses described in items 2 and 3, were not produced by the tool (hose cutter)described in item 1. 2. The toolmarks present on the pieces of hoses described in items 2 and 3, were produced by the same tool.
QMTN44	[No Conclusions Reported.]
QYPTC4	Item 1 is a pair of hose cutters manufactured by Orbit that employ a cutting/slicing type action. Test cuts were made with the Item 1 hose cutters and designated as Item 1 -T1 and 1-T2, and Item 1-T3 and 1-T4. Items 2 and 3 were examined for the presence of toolmarks. Toolmarks of value were found on one end of each of the hoses. These toolmarks were microscopically compared to the test cuts made by the Item 1 hose cutters. There is an agreement of all discernible class characteristics and a sufficient agreement of individual characteristic to identify the toolmarks on Items 2 and 3 as having been cut by the Item 1 hose cutters.
R26QWC	I used the hose cutter to cut tests on the hoses. I marked the tests B1-B2 and C1-C2 and compared the tests with exhibits. The tests and the exhibits were positive: striation marks.
REVD9Y	2.1 The marks on the red hose piece (item 3) were produced by the hose cutter (item 1) received. 2.2 It cannot be determined if the marks on the blue hose piece (item 2) were or were not produced by the hose cutter (item 1) received.
RK4K8P	Examination of Item 1 revealed an Orbit pipe cutter. Microscopic examination and comparison of test toolmarks from Item 1 and the toolmarks present on Items 2 and 3 revealed that both Items 2 and 3 were cut by Item 1.
RRZCG6	The toolmarks on the two hoses were made by the same tool. Furthermore there are striae on the same location who are opposed to the cutting-direction. The toolmarks on the hoses indicates that the hoses have been compressed during the cutting process. This would be compatible to the suspect's hose cutter. However the test marks realised with the suspect hose cutter do not match to the questioned toolmarks. Also the striae opposed to the cutting-direction can not be reproduced. The suspect's hose cutter did not cause the damage on the heating oil supply hoses.
RTCCEY	Examined the specimen in the envelope marked #2. It is a piece of flexible blue hose. Examined the specimen in the envelope marked #3. It is a piece of flexible red hose. Examined the specimen marked #1. It is an Orbit tubing cutter. The two specimens in the envelopes marked #2 and #3 were compared microscopically against test standards cut by the specimen marked #1 and identified as having been cut by the submitted cutter.
RUPNAJ	On 2017-10-25 during the performance of my official duties I received a sealed evidence bag with number PA4001476931 from Case Administration of the Ballistics Section containing the following exhibits: 3.1 One (1) Orbit manufactured with red and black coloured plastic hose cutter marked "Item 1". 3.2 One (1) blue coloured piece of hose marked "Item 2". 3.3 One (1) red coloured piece of hose marked "Item 3". 3.4 Two (2) testing hose samples in red and blue colour respectively, not marked. 4. The intention and scope of this forensic examination comprise of the following: 4.1 Examination of toolmark related materials and tools. 4.2 Microscopic individualization of toolmarks. 5. For microscopic comparison test purposes the following operations were performed: 5.1 I used the hose cutter mentioned in paragraph 3.1 to produce two (2) tests (marked T1 and T2 individually)

TABLE 2

WebCode	Conclusions
	from the samples mentioned in paragraph 3.4. 6.1 examined the exhibits and tests mentioned in paragraphs 3.2, 3.2 and 5.1 using a comparison microscope and found: 6.1 It could not be determined if the exhibit mentioned in paragraph 3.2 was or was not cut by the hose cutter mentioned in paragraph 3.1. 6.2 The exhibit mentioned in paragraph 3.3 was cut by the hose cutter mentioned in paragraph 3.1.
RY4JUM	Test marks made by a item 1 were microscopically compared to the toolmarks on items 2 and 3 and found to have sufficient individual characteristics to conclude an identification. Therefore, the tube cutters in item 1 cut the tubes in items 2 and 3.
T23AKY	Comparison microscope examinations were conducted and it is the finding of this examiner that the tool marks found on the first and second cut piece of hose, Items 2 and 3, were made by the submitted Orbit hose cutter, Item 1.
T4TDD7	Tool Mark Analysis: Methodology - Comparison Microscopy: The tool mark on Item 2, the PVC hose, was made with Item 1, the hose cutters, based upon corresponding class and individual microscopic characteristics. The tool mark on Item 3, the PVC hose, was made with Item 1, the hose cutters, based upon corresponding class and individual microscopic characteristics.
TTVCWV	For the realization of the study, marks produced in hose sent for test are obtained from the hose cutter (item 1). In the comparison between the known marks and the problems marks, the existence of sufficient coincidences of individualized marks observed allow us to determine the following: 1. The hose cutter (item 1) cut the hose (item 2). 2. The hose cutter (item 1) cut the hose (item 3). In both cases, these coincidences were with the left face of the cutting blade of the tool (item 1).
TX6QHZ	Test marks were made by using Exhibit 1 cutter to cut a red colored exemplar hose. The test marks were designated 1AT1, 1BT1, 1AT2, and 1BT2. The test marks and the toolmarks on Exhibit 2 and Exhibit 3 were microscopically compared. Exhibit 2 and Exhibit 3 were identified as having been cut by the Exhibit 1 cutter.
TYFHPV	It was determined utilizing comparison microscopic examination that the questioned partial toolmark impressions from item 2 and item 3 were positively made by the item 1 tool.
U478PZ	The hose cutter item 1 was used to cut the hoses item 2 and 3.
UAFHLZ	Exhibit 1 is an Orbit brand hose cutter. Test toolmarks were produced using Exhibit 1 and designated as 1-T1 and 1-T2. Exhibits 2 and 3 were microscopically examined for the presence of comparable toolmarks. Toolmarks indicative of a shearing or slicing action were observed on the circumference of the cut end of each hose. Microscopic comparisons were conducted between the toolmarks observed on Exhibits 2 and 3 and the test toolmarks produced using Exhibit 1, and the Exhibit 1 hose cutter was identified as having produced the toolmarks on the Exhibit 2 and 3 hoses.
UC37YL	The hose cutter was identified as having cut the two pieces of hose (1-02-AA and 1-03-AA) due to consistent and repeatable marks. This piece of hose was identified as having been cut by the submitted hose cutter (1-01-AA) due to consistent and repeatable marks.
UHTEQ8	Tool Mark Analysis: Test marks were made with Item 1, the Orbit hose cutters, using submitted testing media. Item 1A, the test cuts, was sealed in a manila envelope and will be retained in the laboratory for possible future analysis. Methodology - Comparison Microscopy: The tool marks on Items 2 and 3, the plastic hoses, were made with Item 1, the Orbit hose cutter based upon corresponding class and individual microscopic characteristics.
UMWKYH	Item 1 was physically and microscopically examined and found to be in working order. The test specimens were returned to your Agency with the other evidence for long term storage as evidence. Item 2 was physically examined and microscopically compared with test specimens cut by Item 1. Matching individual identifying characteristics were found and it was concluded that Item 2 was cut by Item 1. Item 3 was physically examined and microscopically compared with test specimens cut by Item

TABLE 2

WebCode	Conclusions
	1. Matching individual identifying characteristics were found and it was concluded that Item 3 was cut by Item 1.
UQKWXN	The evidence in items 1, 2, and 3 was analyzed by physical and microscopic examination. The toolmarks present on the two (2) cut pieces of hose in items 2 and 3 were determined to have been made by the hose cutter in item 1.
V6XH4Y	Item 1.1 is a hose cutter. Tests were made in pieces of hose submitted with Item 1.1. Items 1.2 and 1.3 are two pieces of cut hose. The damaged areas of Items 1.2 and 1.3 were microscopically compared to the tests made using Item 1.1. Item 1.1 was identified as having caused the damage to Items 1.2 and 1.3.
VARLNQ	Item 2(Blue), Item 3(Red) are produced by Item 1(Hose cutter).
VCFZBF	3. On 2017-10-30 during the performance of my official duties I received a sealed evidence bag with number PA4001476935 from Case Administration of the Ballistics Section, containing the following exhibits: 3.1 One (1) hose cutter tool marked by me "513724/17 1". 3.2 One (1) blue piece of hose marked by me "513724/17 2". 3.3 One (1) red piece of hose marked by me "513724/17 3". 3.4 Two (2) pieces of hoses for test purposes (blue and red). 4. The intention and scope of this forensic examination comprise the following: 4.1 The examination of tool and toolmark related materials. 4.2 Microscopic individualization of toolmarks. 5. I examined the piece of hoses mentioned in paragraphs 3.2 and 3.3 and made replications for test purposes marked as 724T1 and 724T2 with tool mentioned in paragraph 3.1 and piece of hoses mentioned in paragraph 3.4. 6. I compared the individual and class characteristics markings on the piece of hoses mentioned in paragraphs 3.2, 3.3 and 5 using a comparison microscope and found: 6.1 The marks on the piece of hose mentioned in paragraph 3.3 were produced by the tool mentioned in paragraph 3.1 6.2 It cannot be determined if the marks on the piece of hoses mentioned in paragraphs 3.2 and 3.3 were produced or were not produced by the same tool. 6.3 It cannot be determined if the marks on the piece of hose mentioned in paragraph 3.2 were produced or were not produced by the tool mentioned in paragraph 3.1.
VCGT9M	Test toolmarks were created using the pipe cutter, Item 1, and microscopically compared to the toolmarks exhibited on the two pieces of hose, Items 2 and 3. Based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks exhibited on the two pieces of hose, Items 2 and 3, were identified as having been created using the pipe cutter, Item 1.
VMYEEH	3. On 2017-11-09 during the performance of my official duties I received a sealed evidence bag with number PA4001476934 from Case Administration of the Ballistics Section, containing the following exhibits: 3.1 One (1) Orbit hose cutter marked by me "513684/17 1". 3.2 One (1) blue piece of hose marked by me "513684/17 2". 3.3 One (1) red piece of hose marked by me "513684/17 3". 4. The intention and scope of this forensic examination comprises the following: 4.1 Microscopic individualization of toolmarks. 5. I examined the Orbit hose cutter mentioned in paragraph 3.1 and made replications for test purposes and marked them "1T1", "1T2", "1T3" and "1T4" respectively. 6. I compared the individual and class characteristic markings on the hoses mentioned in paragraphs 3.2 and 3.3 with the tests mentioned in paragraph 5 using a comparison microscope and found: 6.1 The marks on the hoses mentioned in paragraphs 3.2 and 3.3 were produced by the hose cutter mentioned in paragraph 3.1.
VP33ZY	The suspect's hose cutter did not cut any of the submitted pieces of hose being items 2 and 3. The microscopic characteristics on the test cut piece were different to those found on the items 2 and 3. Items 2 and 3 had similar class and striation characteristics hence being concluded that they were cut by the same tool.
WBJ3HY	Item#3 Was cut by the suspect's cutters item# 1. Item#2 was not cut by the suspect's cutter item#1
WCBX68	the suspect's hose cutter was used to cut the heating oil line both pieces first one (1) is blue hose

TABLE 2

WebCode	Conclusions
	second (02) is red hose. There is sufficient tool marks, transferred from tool to exhibits which is hose cutter, two pieces of hose.
WKLCTV	Items 2 and 3 were cut by the same tool, but not by Item 1.
WPY3BJ	The red handled hose cutter (item 01-01) cut the blue hose (item 01-02) and the red hose (item 01-03).
WV449R	Based on the sufficient agreement of the individual characteristics of the striation marks on the cut surface made by the control hose cutter marked "Item 1" on test hose and the striation marks on the cut surface of the questioned hoses marked "Item 2" and "Item 3", it was found that the hoses marked "Item 2" and "Item 3" were cut by the hose cutter marked "Item 1".
WVLRVT	Item 1-1 hose cutter was used to make test toolmarks in the reference hose submitted for analysis. Items 1-2-1 and 1-3-1 hoses each have a striated toolmark on one end. The toolmarks on items 1-2-1 and 1-3-1 were microscopically compared to the test toolmarks made by item 1-1 hose cutters in the reference hose. The toolmarks on item 1-2-1 could neither be identified nor eliminated as having been made by the item 1-1 hose cutter. The inconclusive conclusion is a result of insufficient similarities or differences in the patterns of microscopic markings observed between item 1-2-1 and the test toolmarks to which it was compared. The toolmarks on item 1-3-1 were identified as having been made by the item 1-1 hose cutter based on sufficient similarities in the patterns of microscopic markings observed between item 1-3-1 and the test toolmark to which it was compared.
WXWVKX	The Item 001-02 and 001-03 cut hoses were microscopically compared to test cuts from the 001-01 hose cutters with the following results: The 001-02 and 001-03 cut hoses were identified as having been cut by the 001-01 hose cutters.
X7GKGP	No correspondence was seen between the test marks made by the hose cutter Item 1 and the toolmarks on the pieces of hose in Items 2 & 3. In my opinion, the toolmarks on Item 2 & Item 3 were not made by the hose cutter Item 1. The toolmarks on Items 2 & 3 have been made by another tool.
XD3DUA	Item 1 was examined and found to be an "Orbit" brand hose cutter in working order. No trace evidence was observed on the cutting edge of the hose cutter. Test cuts were made with the hose cutter onto submitted hoses for testing purposes. The test cuts were cast using Accutrans for microscopic comparison purposes. Items 2 and 3 were examined and found to contain microscopic tool marks for comparison purposes. The cut areas were cast using Accutrans for microscopic comparison purposes. After microscopic comparison of the test cuts made with Item 1 (hose cutter) to Items 2 and 3 (hoses) it was determined that Items 2 and 3 (hoses) were cut by Item 1 (hose cutter).
XG4CBU	1. Examination of Exhibit 1 revealed one single blade opposed jaw hose cutter. Exhibit 1.1 (test cuts) was created from the provided tubing for microscopic comparison and will be returned with Exhibit 1. 2. Microscopic comparison revealed Exhibits 2 and 3 (cut pieces of hose) were cut with Exhibit 1 (hose cutter).
XLVP7Q	Test tool marks produced from the cutting tool in Item 001-01 were microscopically examined in conjunction with the tool marks present on Items 001-02 and 001-03. Based on these comparative examinations the following was determined: Tool marks on Item 001-02 and Item 001-03 had been produced by Item 001-01 tool. Item 001-04 and 001-05 submitted as test media.
Y92PTT	Both of the questioned toolmarks on the submitted pieces of hoses(item 2 and item 3) were produced by the suspect's hose cutter (item1).The examination consisted of following steps. step1-We compared the questioned toolmarks on the submitted pieces of hoses (item 2 and item 3)each other.We deduced that both of the questioned toolmarks were produced by the same tool. Step2- We cut test materials with the suspect's hose cutter to produce test toolmarks. Step3- We compared test toolmarks and questioned toolmarks and deduced that the questioned toolmarks on the submitted pieces of hoses were produced by the suspect's hose cutter(item1)

TABLE 2

WebCode	Conclusions
Y978VX	I conducted a comparative microscopic examination between test pieces of plastic hose I cut using the hose cutters (Item 1), and the cut sections of plastic hose (Item 2) and (Item 3). The quantity and quality of correspondence between the striations present in the cut surfaces of the hose in the test samples and the exhibits was overwhelming in both instances. In my opinion, the hose cutters (Item 1) had been responsible for cutting both pieces of the plastic hose (Item 2) and (Item 3), using the rear part of the blade. Given the blade displays randomly positioned grind marks from manufacture, I do not believe the high degree of correspondence I saw in the striations on the cut hose could possibly occur by chance, if the hose cutters (Item 1) were not responsible.
YDZ76M	The hose cutter received as "item1" has been the tool used to cause the damage of the pieces codified as "item2" and "item3", beyond any doubt.
YL9HHK	Test toolmarks were created using the Orbit brand hose cutter, Item 1, and microscopically compared to toolmarks displayed on the two sections of hose, Items 2 and 3. Based on agreement of discernible class characteristics and sufficient corresponding individual detail, the toolmarks exhibited on the two sections of hose, Items 2 and 3, were identified as having been created using the Orbit brand hose cutter, Item 1.
YMKC3Q	The marks on the cut piece of hose marked 2 were produced by the hose cutter marked 1. The marks on the cut piece of hose marked 3 were produced by the hose cutter marked 1
YR3E8B	Proficiency Test 2017-529, Participant Code [number]. Examination of Item #1 revealed one (1) Orbit brand hose cutter, red and black in color. Examination of Item #2 revealed one (1) portion of hose, blue in color, one end painted green, with toolmarks observed on the questioned cut end. Examination of Item #3 revealed one (1) portion of hose, red in color, one end painted green, with toolmarks observed on the questioned cut end. Tests were obtained by using Item #1 and the tests were microscopically compared to the questioned toolmarks observed on Items #2 & #3 with the following results: The Orbit brand hose cutter (Item #1) was used to cause the toolmarks observed on both portions of hose (Items #2 & #3).
YRDE46	3. On 2017-10-31 during the performance of my official duties I received a sealed evidence bag with number PA4001476933 from Case Administration of the Ballistics Section, containing the following exhibits: 3.1 One (1) Orbit-manufactured maroon hose cutter, marked by me "513699/17 Item 1". 3.2 One (1) piece of blue hose, marked by me "513699/17 Item 2". 3.3 One (1) piece of red hose, marked by me "513699/17 Item 3". 3.4 One (1) piece of blue hose not marked. 3.5 One (1) piece of red hose not marked. 4. The intention and scope of this forensic examination comprise the following: 4.1 Examination of tools and toolmark related materials. 4.2 Microscopic individualization of toolmarks. 5. I examined the hose cutter mentioned in paragraph 3.1 and made replications for test purposes with the piece of blue hose mentioned in paragraph 3.4, marked by me as BT1, BT2, BT3, BT4, BT5, BT6, BT7 and BT8 respectively. 6. I examined the hose cutter mentioned in paragraph 3.1 and made replications for test purposes with the piece of red hose mentioned in paragraph 3.5, marked by me as RT1 and RT2 respectively. 7. I compared the individual and class characteristics markings on the pieces of hose mentioned in paragraphs 3.2, 3.3, 5 and 6 respectively, using a comparison microscope and found : 7.1 The marks on the piece of blue hose as well as the marks on the piece of red hose mentioned in paragraphs 3.2 and 3.3, were produced by the hose cutter mentioned in paragraph 3.1.
YUKWZF	The two submitted pieces of hose (Items 2 and 3) were cut by the submitted hose cutter (Item 1).
YX4TQQ	The Item 1 hose cutter was identified as having made the toolmarks on Items 2 and 3.
YYDVGW	Tools, like the submitted hose-cutter, have individual surface-features, due to their manufacturing process and use. These surface-features can be transferred onto objects that are worked with the tool. If toolmarks show sufficient details that were caused by the corresponding individual structures of the tool, the tool can be identified to have caused the toolmarks. Due to the individual features in the submitted toolmarks, it is proven that: The toolmarks on Item 2 and Item 3 were caused by the

TABLE 2

WebCode	Conclusions
	hose-cutter Item 1.
Z8NKRA	As a result of the microscopic comparison it is certain, that the toolmarks on the pieces of hose marked as "Item 2" and "Item 3" have been produced by the hose cutter marked as "Item 1".
Z9ENGA	The marks on the pieces of hose marked Item 2 and Item 3 were produced by the Hose cutter (Item 1)
ZGD7ZT	Item 2 displayed some similarity to the test samples but not enough to conclude that the marks present on Item 2 were made by Item 1. To go further, using the five-point scale of conclusions, the result with respect to Item 2 would be Limited-exclusion. Item 3 was identified as possessing toolmarks made by Item 1.
ZL6F7K	Upon analysis I found; Hose cutter (Item 1) was used to cut Item 2 (Blue Hose).Furthermore, Item 3 (Red hose) was not produce by Item 1.
ZNDP3N	The marks on the cut pieces of blue and red hose marked 500710/17 '2' and '3' were produced by the hose cutter marked 500710/17 '1'
ZRUR89	The cut ends of the Item 2 and Item 3 hoses were microscopically examined and identified as having been cut by the same tool. Due to differences in individual characteristics, Items 2 and 3 were eliminated as having been cut by Item 1. Four (4) tests produced with Item 1 and laboratory stock materials are being returned as Item 1T in Container Sample Pack T2 and should be maintained for possible future examinations.
ZXJALJ	The evidence in items 1, 2, and 3 was analyzed by physical and microscopic examination. The toolmarks present on the two (2) pieces of cut hose in items 2 and 3 were determined to have been made by the hose cutter in item 1.
ZZ6ETG	Item2(Blue hose) and Item3(Red hose) are cutted by the Item1 (suspected hose cutter).

Additional Comments

TABLE 3

WebCode	Additional Comments
2CF9LL	<p>Methods: Toolmark Examination: Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison. First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1) Exclusion (Elimination): If two toolmarks or a tool and toolmark have incompatible class characteristics, an Exclusion opinion is rendered. 2) Identification: If the following conditions are met during the comparison of microscopic marks, an opinion of Identification is rendered: a) The degree of similarity is greater than the examiner has ever observed in previous evaluations of toolmarks known to have been created by different tools. b) The degree of similarity is equivalent to that normally observed in toolmarks known to have been created by the same tool. When these conditions are met the likelihood another tool could have produced the same mark is so remote as to be considered a practical impossibility. An Identification opinion cannot be reported unless a second qualified toolmarks Examiner has examined the items in question and reached the same conclusion. 3) Inconclusive (No Conclusion): If the conditions required for an Exclusion or Identification are not observed, an opinion of Inconclusive is rendered. A failure to meet the conditions for an Exclusion or Identification could be the result of limited microscopic marks of value, a lack of any observed microscopic similarity, or microscopic similarity that is present but too limited to meet the criteria for identification. Limitations: Toolmark Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such.</p>
4R6VAP	<p>The damage to the cut pieces of hose on Items 2 and 3 was caused by the same tool, however the damage was not caused by the submitted hose cutter, Item 1.</p>
6LC77Q	<p>Cuts to both Items 2 & 3 were made whilst their pipes were cradled closest to the tools pivot and not in the usual mounting position further along the blade.</p>
ANLRY9	<p>The item 2 piece of hose bears similar but insufficient microscopic marks to permit a positive identification to the item 1 hose cutter. There are areas of agreement and disagreement throughout the cut surface.</p>
AWFYHE	<p>Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Toolmark: Examination Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison. First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1) Exclusion (Elimination): If two toolmarks or a tool and toolmark have incompatible class characteristics, an Exclusion opinion is rendered. 2) Identification: If the following conditions are met during the comparison of microscopic marks, an opinion of Identification is rendered: a) The degree of similarity is greater than the examiner has ever observed in previous evaluations of toolmarks known to</p>

TABLE 3

WebCode	Additional Comments
	<p>have been created by different tools. b) The degree of similarity is equivalent to that normally observed in toolmarks known to have been created by the same tool. When these conditions are met the likelihood another tool could have produced the same mark is so remote as to be considered a practical impossibility. An Identification opinion cannot be reported unless a second qualified toolmarks Examiner has examined the items in question and reached the same conclusion. 3) Inconclusive (No Conclusion): If the conditions required for an Exclusion or Identification are not observed, an opinion of Inconclusive is rendered. A failure to meet the conditions for an Exclusion or Identification could be the result of limited microscopic marks of value, a lack of any observed microscopic similarity, or microscopic similarity that is present but too limited to meet the criteria for identification. Limitations: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. Toolmark Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such.</p>
DYAUUC	Tests generated during examination are being returned in the same container as the Item 1 tool.
EN9VGW	The exhibit & tests was cut using the same type of material.
G2NTEW	Inconclusive result due to the lack of observed matching individual detail needed for an ID but, similarity in overall contours and quality of detail precludes an elimination.
G948KM	All exhibits were handling with care during and after examination process.
GGFQGR	Well designed test.
HAVPYT	Tool marks observed Item 2 (Portion of a 5/8 inch diameter blue hose) could not be identified or eliminated (inconclusive) as having been produced by Item 1 (Orbit hose cutter). The individual characteristics present do not display sufficient agreement.
HLMC8A	Because variables including (but not limited to) the amount of pressure used, the velocity, the angle and the exact manner in which the evidence tubes were cut remains unknown, the submitted tool cannot be conclusively eliminated. Nor could significant matching stria be identified between the knowns and the unknowns. Therefore, inconclusive was reported.
HRUZNH	LIMITATIONS: Practical Certainty: Since it is not possible to collect and examine samples of all tools, it is not possible to make an identification with absolute certainty. However all scientific research and testing to date and the continuous inability to disprove the principles of toolmark analysis have demonstrated that tools produce unique, identifiable characteristics which allow examiners to reliably make identifications. Firearms/Toolmark Identification is an empirical science that relies on objective observations and a subjective interpretation of microscopic marks of value. There are an agreement of all class characteristics with insufficient individual characteristics in agreement or disagreement for an identification or elimination between test #1-1 and #2. (Test #1-1 vs test #1-1 have excellent agreement;) (Test #1-1 vs #2 have some agreement but not as good as test vs test)
JMD4BR	Not all tests materials are suitable for test purposes. Test material must possess special properties to be able to reproduce small detail, high contrast for microscopic examination, easy applicable and good releasing ability with a short cast setting-time in order not to damage cutting edges of the tool. In this case the test material is suitable for the tests.
JYQ3K2	The toolmarks on both pieces of hose (item 2 and 3)and the comparison marks made by the hose cutter show numerous well matching marks with general and individual characteristics.

TABLE 3

WebCode	Additional Comments
KBEN32	<p>Methods: Tool: The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared. Toolmark Examination: Toolmarks, whether they are present on two evidence items or on one evidence item and one test-mark created in the Laboratory, undergo two stages of comparison. First, the toolmarks are examined to determine and compare their class characteristics. The class characteristics of toolmarks include type of cutting action and the size and orientation of gripping or cutting surfaces. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy. A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued: 1) Exclusion (Elimination): If two toolmarks or a tool and toolmark have incompatible class characteristics, an Exclusion opinion is rendered. 2) Identification: If the following conditions are met during the comparison of microscopic marks, an opinion of Identification is rendered: a) The degree of similarity is greater than the examiner has ever observed in previous evaluations of toolmarks known to have been created by different tools. b) The degree of similarity is equivalent to that normally observed in toolmarks known to have been created by the same tool. When these conditions are met the likelihood another tool could have produced the same mark is so remote as to be considered a practical impossibility. An Identification opinion cannot be reported unless a second qualified toolmarks Examiner has examined the items in question and reached the same conclusion. 3) Inconclusive (No Conclusion): If the conditions required for an Exclusion or Identification are not observed, an opinion of Inconclusive is rendered. A failure to meet the conditions for an Exclusion or Identification could be the result of limited microscopic marks of value, a lack of any observed microscopic similarity, or microscopic similarity that is present but too limited to meet the criteria for identification. Limitations: Tool: The results of tool examinations describe type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline. Toolmark Examination: Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to changes in tool working surfaces from wear, corrosion and abuse or the employment of unusual tool/work piece orientations, toolmarks created by the same tool are not always identifiable as such.</p>
LMR8Z4	Tests generated during examination are being returned with Item 1.
NVXNNE	All the exhibits were handled with care during and after the examination process.
PGTPC3	<p>"Sufficient agreement" exists between two toolmarks means that the agreement is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility. Sufficient agreement is related to the significant duplication of random toolmarks as evidence by a pattern or combination of patterns of surface contours.</p>
R26QWC	The hose cutter is positive with the hoses.
REVD9Y	The marks on item 2 are insufficient and because of this a positive identification or elimination (exclusion) cannot be made.
TTVCWW	The difficulty of the comparison has been the flexibility and elasticity of the material and the morphology of the hoses (items 2 and 3). This fact produce different distances between the marks to vary depending on the deformation suffered in the hose at the time of cutting.
VARLNQ	1. Comparing scratch on the Hose(Item 2 & Item 3): The Item2 Hose(Blue)'s scratch is matched with Item3 Hose(Red)'s; 2. Comparing scratch on the Hose(Item 2 & Item 3 with Sample): The sample Hose

TABLE 3

WebCode	Additional Comments
	cutted by Item 1 (Hose cutter) is matched with Item 2 (Blue) & Item 3 (Red). In conclusion, Item 2 (Blue) & Item 3 (Red) are cutted by the Item 1 (Suspected cutter)
WBJ3HY	* Item 1 and item 2 have similar class but they have different individual markings.
WCBX68	All exhibits were handled with care during and after examination process.
WV449R	The striation marks on the cut surface of the hoses marked "Item 2" and "Item 3" were made by the same side of the blade of the hose cutter marked "item 1".
WVLRVT	The toolmarks on item 1-2-1 could neither be identified nor eliminated as having been made by the item 1-1 hose cutter. The inconclusive conclusion is a result of insufficient similarities or differences in the patterns of microscopic markings observed between item 1-2-1 and the test toolmarks to which it was compared.
Y92PTT	If there is a need, we can send the images of these positive identifications.
Y978VX	Both sections of hose were cut closer to the pivoting end of the blade, rather than the forward part of the blade where the hose would naturally sit within the cup in the lower jaw of the hose cutters. For this reason, I suspect some laboratories may exclude the cutters as being responsible in this test as they may have only compared the striae formed from the front part of the blade, and not from the part closer to the pivot. To obtain tests using the rear part of the blade, the hose has to be firmly held in position away from the natural position of the cup shape in the lower jaw. A good test in this regard as it forces the examiner to consider other possibilities other than the "natural" or obvious one, when using the cutters to make test samples.
YRDE46	The pressure used to cut, the specific area on the hose cutter one cuts and the angles at which these exhibit hoses were cut, played a major role in how the markings were transferred to the different sized hoses.
YX4TQQ	Portions of the Item 1 blue and red hoses were used for testing, the remaining hose was not further examined.
Z8NKRA	The comparison marks of the cutting pliers ("Item 1") and the questioned toolmarks on the hose pieces ("Item 2" and "Item 3") have been moulded using "AccuTrans" moulding material. The comparison has been performed with a comparative microscope.

Appendix: Data Sheet

Collaborative Testing Services ~ Forensic Testing Program Test No. 17-529: Toolmarks Examination

DATA MUST BE RECEIVED BY November 20, 2017 TO BE INCLUDED IN THE REPORT

Participant Code:

WebCode:

Accreditation Release Section

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

- This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section on the last page must be completed and submitted.)
- This participant's data is **NOT** intended for submission to ASCLD/LAB, ANAB or A2LA.

Scenario:

Police are investigating the vandalism of a business's heating oil line. Two of the pressurized heating oil supply hoses were cut. Investigators have a suspect in custody and recovered a hose cutter later that day from his vehicle. The hose cutter and the sections of cut hose are being submitted for your examination.

Please note the following:

- Be careful when opening the hose cutter, as it is spring loaded and the blade is sharp.
- Two pieces of hose have been included for possible test mark purposes.
- To assist in distinguishing the side of hose NOT to be examined, the ends of the Item 2 and Item 3 hose have been marked with green paint.

Items Submitted (Sample Pack T2):

- Item 1: Hose cutter recovered from suspect's vehicle.
- Item 2: First cut piece of hose. (blue)
- Item 3: Second cut piece of hose. (red)

1.) Did the suspect's hose cutter (Item 1) produce the questioned toolmarks on either of the submitted pieces of hose (Items 2 or 3)?

Item 2	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	Inconclusive*	<input type="checkbox"/>
Item 3	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	Inconclusive*	<input type="checkbox"/>

*Should an item(s) be marked "Inconclusive", please document the reason in the Additional Comments section of this data sheet.

Please return all pages of this data sheet.

Page 1 of 3

Participant Code:

WebCode:

2.) What would be the wording of the Conclusions in your report?

3.) Additional Comments

<p>Return Instructions: Data must be received via online data entry, fax (please include a cover sheet), or mail by November 20, 2017 to be included in the report. Emailed data sheets are not accepted.</p>	<p>Participant Code: ONLINE DATA ENTRY: www.cts-portal.com</p>
<p>QUESTIONS? TEL: +1-571-434-1925 (8 am - 4:30 pm EST) EMAIL: forensics@cts-interlab.com www.ctsforensics.com</p>	<p>FAX: +1-571-434-1937 MAIL: Collaborative Testing Services, Inc. P.O. Box 650820 Sterling, VA 20165-0820 USA</p>

Please return all pages of this data sheet.

Collaborative Testing Services ~ Forensic Testing Program

RELEASE OF DATA TO ACCREDITATION BODIES

The following Accreditation Releases will apply only to:

Participant Code:

WebCode:

for Test No. **17-529: Toolmarks Examination**

This release page must be completed and received by **November 20, 2017** to have this participant's submitted data included in the reports forwarded to the respective Accreditation Bodies.

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

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

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

A2LA Certificate No. _____

Step 2: Complete the Laboratory Identifying Information in its entirety

Signature and Title _____

Laboratory Name _____

Location (City/State) _____

Accreditation Release	
<u>Return Instructions</u>	
<i>Please submit the completed Accreditation Release at the same time as your full data sheet. See Data Sheet Return Instructions on the previous page.</i>	<i>Questions? Contact us 8 am-4:30 pm EST Telephone: +1-571-434-1925 email: forensics@cts-interlab.com</i>

Please return all pages of this data sheet.