UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

UNITED STATES OF AMERICA,	)	
Plaintiff,	)	Criminal Action
v.	)	No. 13-10200-GAO
DZHOKHAR A. TSARNAEV, also known as Jahar Tsarni,	)	
Defendant.	)	

BEFORE THE HONORABLE GEORGE A. O'TOOLE, JR.
UNITED STATES DISTRICT JUDGE

EXCERPT OF JURY TRIAL - DAY FORTY

Testimony of David McCollam

John J. Moakley United States Courthouse
Courtroom No. 9
One Courthouse Way
Boston, Massachusetts 02210
Thursday, March 26, 2015
9:13 a.m.

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Mechanical Steno - Computer-Aided Transcript

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I N D E X

E X H I B I T S

P R O C E E D I N G S

THE COURT: Morning, jurors.

THE JURY: Good morning, your Honor.

THE COURT: Just two matters before we continue with the evidence. There were two issues from yesterday. After review, I will admit the proffered 1387A, proffered by Mr. Fick, which is the complete text from which selections were made. That will be admitted.

(Exhibit No. 1387A received into evidence.)

09:15 THE COURT: There was a discussion of a couple of photographs, and I will -- that I had expressed some concern about. Those may be used. I'm satisfied that the reason -- there is a value added for those that is not available from the other evidence.

MR. CHAKRAVARTY: Your Honor, just to clarify, 1387A, that would be with the redactions that we had discussed?

THE COURT: Yes. You mean personal identifiers?

MR. CHAKRAVARTY: Correct.

THE COURT: Yes. And I don't have a copy that has

09:15 that, but I'm sure one can be prepared. All right.

MR. CHAKRAVARTY: Your Honor, the government would call David McCollam.

THE CLERK: Sir, want to step up here, please, up to the box, if you would. Remain standing.

DAVID McCOLLAM, Sworn

THE CLERK: Have a seat. State your name. Spell your last name for the record. Keep your voice up and speak into the mic.

THE WITNESS: My name is David McCollam, M-c-C-o-l-l-a-m.

DIRECT EXAMINATION BY MR. CHAKRAVARTY:

Q. Good morning, Mr. McCollam.
A. Good morning.
Q. Do you work at the FBI?
09:16 A. Yes.
Q. What do you do there?
A. I'm a chemist forensic examiner assigned to the Explosives Unit.
Q. Are you a special agent?
A. I am not.
Q. What did you do before you joined the FBI?
A. I was a tour guide at the FBI while I was in college; and before that I was just a student majoring in chemistry at Old Dominion University.
09:17 Q. Is that your entire education?
A. Yes.
Q. After you graduated with your chemistry degree, when did you join the FBI?
A. I started off in the Chemistry Unit in August of 1995.
Q. And can you describe your progress through the FBI

laboratory and the various roles that you've had there?
A. In August of 1995, I was assigned in the Chemistry Unit to a supervisory special agent who worked with explosives. As his chemist, I trained under him and other qualified examiners learning the proper chemical techniques and instrumental techniques that we utilize at the laboratory to identify explosives or energetic materials.
A wide variety of training samples or practice samples was part of my training. At the end of that particular 09:18 training, I would take a series of batteries of competency tests. At the end those competency tests, I was then able to work independently within the laboratory. I've taken past yearly proficiency tests. And then in January of 2000, there was a reorganization of the laboratory where we got shifted over to the Explosives Unit. And then in July of 2004, I became a qualified forensic examiner.
Q. What is a qualified forensic examiner?
A. The extra training, aside from the bench chemistry that I was trained in the Chemistry Unit, it's just a series of 09:18 writing reports, working with more samples, a series of oral board evaluations on explosives, administrative functions within the laboratory.
Q. You mentioned something called bench work. What's bench work?
A. Bench work is just analyzing evidence that's submitted to

the laboratory using different procedures, techniques, to get those chemicals, residues or explosive material onto the instruments that we utilize on a daily basis.
Q. What is the purpose of forensic chemistry in explosives investigation?
A. With forensic chemistry, we're just using very scientific principles to identify explosive compounds or compounds that can be used to make explosives with a wide variety of analytic techniques, scientific methods, to arrive at a conclusion.
09:19 Q. What kind of explosives can you test for?
A. Pretty much everything. There's a wide variety of different type explosives. There are low explosives. There are high explosives. There are hundreds of different types of explosives that exist that we're able to analyze and identify.
Q. Now, continuing with your background, as you progressed as a chemist at the FBI lab, did you have an opportunity to actually conduct forensic examinations on submissions, evidentiary submissions, for testing for chemicals?
A. Yes.
09:19 Q. And approximately how many times have you conducted forensic chemistry exams in explosives cases?
A. Literally thousands of samples involving hundreds of different cases.
Q. Was your work peer-reviewed on a general level, and on specific occasions did people verify your work?

A. Whenever we -- or I write a report at the laboratory, the data that I generate, the report that I've written, has to go through a technical review process. So there's another chemist examiner who has the same qualifications, who's been through the same training process that I have. That individual would review the report and the technical data with my conclusion; and if he agrees with it, then he'll sign the report out. There's also administrative review that's done as well in conjunction with that.
09:20 Q. And do you work with a team of various analysts, agents, and examiners?
A. Correct.
Q. In the course of your work at the FBI, have you had an opportunity to continue continued education or on-the-job training?
A. Yes. The FBI mandates that we have to have approximately eight hours of continuing education, so that can exist either by taking classes which are sponsored by the instrument manufacturers that I use at the laboratory to study the theory, 09:21 or I can take, you know, explosives classes that are offered. There's a wide variety of those. I can attend conferences on explosives with the United States or overseas as well.
Q. Have you continued to do that --
A. Yes.
Q. -- during your time, now almost 20 years at the FBI?

A. Yes.
Q. Now, as part of the Boston Marathon investigation, what was your role?
A. I stayed back at the laboratory, and then I started receiving many submissions on April 16th centered around the investigation. So it was my job to coordinate the efforts in the laboratory that evening. Many samples were received from the two devices at Boylston Street, the incident at Watertown, and then in subsequent searches during the following weeks of the investigation.
Q. And, ultimately, did you analyze that evidence?
A. Yes. Myself and my team analyzed approximately 300 pieces of evidence.
Q. Did you draft a report?
A. I did.
Q. Did you prepare to come up here to testify in the case?
A. I did, yes.
Q. Have you testified in other cases?
A. I have.
Q. About how many times?
A. This is my tenth time.
Q. That's always in this capacity of talking about explosives chemistry?
A. Correct, yes.
Q. What is an explosive?

A. An explosive can be described as a pure substance or a mixture of substances that's capable of producing explosion by its own energy. What they're designed to do is they're designed to react very quickly, within thousandths of a second or hundreds of thousandths of a second. And all they're designed to do is just release a tremendous amount of gas, and that gas is generated. It's designed to do work, to blow stuff up in mining, engineering or, with military applications, just to shatter and destroy things.

09:23 So since there's so many different types of explosives and they react differently, they have to be classified into two different categories. We have low explosives and high explosives. And they're based on how quickly they react. So a low explosive, the material that's reacting is going at less than the speed of sound. A high explosive, on the other hand, reacts faster than the speed of sound. So examples of high explosives you may have heard of would be TNT or C4, dynamite, nitroglycerin. Those are all military-type explosives that we can see.

09:23 On the other hand, we have low explosives. These are commonly referred to as propellents. They're mixtures of different chemicals. They're mixtures of oxidizers and fuels. Now, in order to get that fuel to burn, it needs a chemical source of oxygen. It's like I stated earlier, they're designed to work or react so quickly they can't take oxygen from the air, can't diffuse that fast, so we have to bring in a chemical source of oxygen called the oxidizer. There are many different types of oxidizers out there: potassium nitrate, potassium perchlorate, barium nitrate. And all they do is supply that oxygen to the fuel, which could be carbon or sulfur, aluminum powder, magnesium as well.

Low explosives, pyrotechnics are low explosives, and also propellents. A propellent would be, like, black powder or smokeless gunpowder, which is commonly found in ammunition. 09:24 And for pyrotechnics, that category, it's used by the military for signaling, like, smoke grenades. You can find them in common household kitchen matches, road flares, signaling flares, and also commercially available pyrotechnics or fireworks.

Q. So you talked about two different types of explosives: high explosives and low explosives.
A. Yes.
Q. High explosives, I think you explained, are military grade or they're commercially available for the specific purpose of 09:25 blowing things up essentially?
A. Correct, yes.
Q. And low explosives, can you describe some of the nondestructive applications of low explosives?
A. Again, low explosives are -- like I said, they're road flares, kitchen matches. There's pyrotechnic material that's

on there. Black powder, people can go to, as a hobby, black powder guns, Civil War reenactments, Revolutionary War reenactments. Those guns or canons use the black powder. When it burns, it reacts. It generates that pressure very quickly, and it's designed to propel something. And then fireworks, Fourth of July, stuff like that. And then the smokeless powder, that's the ammunition propellent. People -- some people are reloaders. So they can go to, like, Dick's Sporting Goods store or Wal-Mart, and they can buy pounds of smokeless powder, and they can reload their own ammunition instead of buying it.

Q. So what is the difference between how high explosives explode versus how low explosives explode?

A. Low explosives are designed to deflagrate or burn, so typically they're initiated with a match or some type of heat source, whether it's a hot wire or a match. And that gets the reaction going. It's very easy. It's very simple to do.

On the other hand, most high explosives need to have some type of shock initiation to them. They're relatively insensitive but they need a shockwave, typically in the form of a detonator, to get them to go. For example, TNT, if I had a block of TNT for demonstration purposes and I took a match to it, it would burn but it wouldn't detonate because there's not enough energy to get those molecules to decompose to react to achieve a shockwave.

So in the blasting industry or military operations, they have commercially available blasting caps. So there's energy put into that blasting cap which starts the explosive train, we call it. There's a shockwave that's developed within that blasting cap, and that blasting cap then propagates that shockwave to the TNT to get it to go.

Q. And how does the low explosive work?

A. Again, it could be a simple match, like a firework. There's a fuse sticking out of it. You light a match. It's a safety fuse, so you can light it and then get away in time, so you could have some type of hot ember or hot -- it's just energy. That heat has to come from some form of energy. It could be a flame. It could be a hot wire. It could be friction is generating energy just enough to get those molecules within that low explosive to start decomposing to get that energy going that it needs to sustain the reaction.

Q. And so for low explosives to actually explode as opposed to just burn, do they need to be contained?

A. Yes. If I -- for example, if I bought two cans of black powder and we went outside and I demonstrated by taking one can and pouring it on a surface, and I took a match and I lit that black powder, you would feel the heat from the thermal decomposition. You would see smoke. It would be white smoke. You would smell the sulfur burning. Black powder is potassium nitrate, oxidizer, sulfur, and carbon as the fuels. They're

burning in that oxidizer. So you would see this reaction. It wouldn't explode. It's relatively harmless other than just, you know, the awe of it. If I take that same amount of powder from the second can, which is a pound of it, and I put that in some type of container, now what's happening is that gas that I talked about earlier that's being generated, that pressure that has built up, it has to go somewhere. It cannot stay within that container. So that pressure, as it builds up over time very quickly within that container while the material is 09:28 burning, that pressure is going to overcome that container in some fashion causing it to peel apart, bust open. That's the explosion that you're hearing. The black powder isn't exploding. It's a chemical reaction. It's causing a mechanical explosion which is the failure of the container which it's contained in.
Q. And how quickly does that process happen?
A. Low explosives are designed to function or react thousandths of a second. In contrast, high explosives are designed to react one, one-hundred-thousandths of a second so 09:29 several orders of magnitude quicker. It's a relatively slow reaction, but on a chemical scale, it's pretty quick. For us to interpret how fast it's reacting, we have a wide variety of instruments or engineers that study these compounds. There's all these instruments they use to understand the reaction rate, the pressure that's generating, and how fast the reaction is

going.

Q. When you see an explosion, are there signals from the observations that you can make about the explosion that might tell you whether it's likely a high-explosive or a low-explosive explosion?

A. When explosives react, you know, the energy that they release is in the form of heat, light, and sound. If you're looking at an explosion going off, you're going to see the light that's going off. You're going to hear it as a loud sound. But there's another process or another -- not a flaw, but what happens with some of the military-type explosives, like TNT, if I initiate a pound of TNT, there's going to be a black cloud that's associated with that because there's a lot of extra carbon within TNT. There's not enough oxygen to react with that. So that carbon soot goes away, and that's the cloud that we see.

On the other hand, with low explosives, there is a lot of oxidizer left over. Some of the products that they're forming, when they start off and they're burning, the products that are left behind are a little bit different. But when they release their gas and energy, there is all these different types of compounds, and they're typically white in color.

Q. So one distinction is a white plume of smoke versus a black plume of smoke?

A. Correct.

Q. Now, in addition to examining explosives when they're in their bulk form or they're intact form, are you able to do post-blast investigation?
A. Yes.
Q. And how do you do that?
A. Post-blast, we're just looking for residues. There may be microscopic traces of material left behind. So there's various procedures that we go through, rinsing them with the material that comes in with chemical solvents, water and then acetone.
09:31 It's a screening technique that we're achieving. Based on the results from those screening techniques will navigate as to other instruments that we may use.
Q. What is the purpose of doing that kind of a post-blast forensic examination?
A. Like I said earlier, there's going to be little bits of residue left behind, so we're using these solvents to determine what explosive may have been used to cause the explosion.
Q. And can you determine using that process specifically what brand of explosive was used, or what's the level of specificity
09:32 that you can arrive at?
A. With low explosives, it's practically impossible. It's difficult to determine what brand it was or anything like that. We don't try to determine, you know, the manufacturer or anything like that.
For high explosives, it's a little bit easier. For

example, TNT I talked about earlier. If that material goes off, there's microscopic traces of TNT residues left behind. I can state with confidence that the explosive contained TNT within there. Whereas, with low explosive, we can't determine, like, a particular brand name or a manufacturer that made that material.

Q. Now, did you examine the evidence from the Boston Marathon investigation?

A. Yes.

09:32 MR. CHAKRAVARTY: Mr. Bruemmer, if we could just call up Exhibit 620.

THE COURT: This is 620 which is in evidence?

MR. CHAKRAVARTY: It is 620 in evidence, your Honor.

Q. Now, Examiner McCollam, starting with Boylston Street, did you examine evidence from a variety of the places where it was collected on Boylston Street from the blast scene of Scene A?

A. Yes.

Q. Examining that evidence, did you arrive at a conclusion as to what the nature was of the explosives involved?

09:33 A. Yes.

Q. What did you conclude?

A. That the residues that were present from the specimens that were submitted from Scene A, those residues are consistent with the deflagration products of a pyrotechnic or firework-type material.

Q. And with regards to Scene B, again, did you examine the evidence submitted that had chemical residues on it and determine the nature of the explosive for Scene B?
A. Yes, I did. Again, the residues from Scene B are consistent with the deflagration products of a low-explosive, pyrotechnic-type material.
Q. Did you also examine the evidence submitted from the Watertown crime scene?
A. Yes.
09:34 Q. And that included both a pressure cooker device as well as several pipe bombs?
A. Yes.
Q. Did you also examine the intact, rendered safe, pipe-bomb material?
A. Yes.
Q. Did you also examine the bulk powder that was in a Rubbermaid container that had not been ignited?
A. Yes.
Q. And did you conclude -- draw any conclusions about the
09:34 nature of those explosives?
A. Yes.
Q. What were those?
A. The bulk material was definitely pyrotechnic flash-powder-type material.
Q. Now, can you explain to the jury what a pyrotechnic

flash-powder-type material is?
A. Pyrotechnics are designed for our amusement. They're Fourth of July-type events. They're made here in the United States, but the bulk of fireworks are made in Asia. They're brought over. And, again, it's just a combination of oxidizers. There's chemical sources of oxygen mixed with the various types of fuel. And the fuel specifically, they're highly reactive fuels such as aluminum or magnesium. That flash that you see, that bright flash is aluminum or magnesium
09:35 burning.
Q. Are there combinations of commercially available pyrotechnics, are they consistent in terms of what elements are contained within those?
A. It's a very complex process how they make them, and it depends on the customer who's ordering the fireworks, what they want. All these different chemical oxidizers that go in there have a various function. Not only are they designed to supply the oxygen during the reaction but the element that's associated with them as well. For example, barium nitrate,
09:36 they add barium nitrate to fireworks because that burns green. So when you're watching fireworks burn, if you see green, it's because the oxidizer barium nitrate is in there. If you see red, that means that the oxidizer strontium nitrate is in there. If you see blue, then you have copper salts or copper nitrate, various compounds that are in there. So the engineers

and the people that make this stuff understand the different colors that these chemicals produce, so they can design these fireworks. So when they're burning in the sky, those materials that you see burning are because of the different elements and the different oxidizers that are associated with them.
Q. All right. And so when you conducted your analysis of each of those various crime scenes and pieces of evidence, can you explain to the jury how you did that?
A. So when the evidence came in, there were many, many pieces that came in. Both from the Scenes A and B were big pieces of metal fragment. In observing those pieces of metal, I could see black-colored material, discoloration on there, residue that was left behind. There was also swabs from the scene. We swab surfaces that can capture residue. And also vacuum samples were submitted as well both from Scene A and B and then the Watertown incident as well.
So what myself and my team did is that we -- if the piece of metal had black residue or discoloration on there, if we were able to scrape that off, we would set that aside for further analyses but decided to focus our analyses -- since there were so many items, to focus our analyses on a technique called ion chromatography. What I'm doing with that is there's a water wash that I'm using, so I rinse the items with water. I filter that water. And then what it's designed to do is these organic -- sorry, inorganic compounds, those oxidizers

09:38 09:39

I'm talking about, are soluble in water. So they're going to be trapped within the water. It's kind of like a chemical soup. So this material goes on the ion chromatograph system. We call that IC. That IC system separates out all those individual components based on how much time they want to spend in the system. So I can get -- say, for example, if I had eight compounds, I could separate out those eight compounds. These are called anions. They have a negative charge to them. So I can determine if there's chloride, if there's nitrate, if there's sulfate, if there's perchlorate, all these different ions that are associated with that. It's just a piece of the puzzle.

Next step would be to analyze that black residue material that we scraped off. We'll grind that up in a mortar. That's going to go on a system called an X-Ray Diffractometer. We call that XRD. What that XRD system does is its sample is sitting in an instrument, and X-rays are focused on that sample. And what the sample does is it rotates through predetermined degrees. It goes from approximately 5 to 75 degree angle. And those X-rays that are focused on the instrument -- or, sorry, the sample will diffract at certain angles because of the crystal lattice structure of the sample that's in there. No two chemicals have the same crystal lattice. We can only do this for solid material. We can't do it for liquids or gels or anything like that. It's only for solid material. So it develops what we call a diffraction pattern which is unique to those specific chemicals or crystal structures. If there's a mixture in there, it can easily separate the mixtures out and give me a diffraction pattern. And that diffraction pattern is searched against a known library of materials that's associated with the instrument.

Finally, that black material is then going to be analyzed by an instrument called Scanning Electron Microscopy with Energy Dispersive X-Ray Spectroscopy. That's a mouthful, so we'll just call that SEM. So what the SEM does, well, there's a detector called the EDS detector. What that detector does is it determines the elemental composition of the material that's in there. It doesn't determine structure or anything like that. It just determines what elements are present. So a lot of these samples contain carbon. They contain oxygen, silicon, sulfur, barium, potassium, chlorine, aluminum, magnesium, all chemicals that are commonly found in pyrotechnic material.

Q. Similarly, are those elements not commonly found on Boylston Street and on Laurel Street in Watertown?

A. No.

Q. Now, once you have identified a number of the different chemicals, how do you conclude -- what can you do with that combination of the various chemicals that you have? How do you use that information?

A. Well, then we just -- once all the data has been collected, we sit down and I start going through all the data, all the notes. And that's when I start arriving at the conclusion that these materials present are consistent with the deflagration of pyrotechnic materials. I've analyzed cases from fireworks before, people making flash powders. We've seen it many times before. I've burn them myself; I've analyzed them myself. So I arrive at that conclusion, and that's when the report process starts to be written.
09:41 Q. You drafted a report. I suspect that's the report in front of you, is that right?
A. Yes.
Q. The analysis you described can tell you what kinds of materials were used. Can you tell how much of that material was used?
A. You can. There's a technique called quantitation, determining how much of something you have. The Explosives Unit on the chemistry side, we don't quantitate anything. We're just trying to determine what's present. Is there an 09:42 explosive there or not. So I did not determine how much of anything was present.
Q. Now, a pyrotechnic mixture comes from fireworks, right?
A. They can. Like I said earlier, there's pyrotechnics for road flares, kitchen matches; the military uses it for various applications. It not just fireworks, but that's a common

source of it.

Q. For a civilian who doesn't work in those other industries which use fireworks -- excuse me, which use pyrotechnics, how would one extract from a firework the pyrotechnic mixture that would be the explosive that you described?

A. Someone would have to mechanically go into the pyrotechnic device to get the filler or the explosive material out of there. For example, a small firecracker, the small, little cylindrical objects you see, by law, they can only have 50 milligrams of material inside of that. But yet there are other commercially available fireworks that are sold that can contain up to hundreds of grams of pyrotechnic material, all legal, depending on what state you live in and how the laws are set up where you can buy them.

But somebody would have to actually go in, cut through the cardboard. Those cardboard tubes and some of those materials are relatively thick. Again, that thickness of the cardboard is to contain the pressure so that the firework could be projected vertically. So there's a lot of effort that will go into separating out the pyrotechnic or firework explosive.

Q. What would happen if you have pyrotechnic mixture from a variety of different low-explosive sources so, like, black powder as well as firework flash powder as well as other types of things?

A. They all burn pretty much the same. Flash powder burns or fireworks burn a little bit hotter than just regular black powder. But they will function -- if they're mixed together, they pretty much function the same.

Q. And to extract from fireworks a pound of explosive -- low-explosive material, about how many fireworks would that require?

A. Again, it depends on what has been purchased. Some of the products -- like I said, the firecracker would be not worth your time because there's only 50 milligrams. There's 454 grams in a pound, so that wouldn't be a good way of doing it. But there are mortars that you can buy. Certain states sell mortars. They can contain up to maybe 30 grams or more of explosive material within them. So if you're looking for a pound, 30 grams, 454 grams in a pound, you would need dozens of those mortars just to create a pound of explosive material.

MR. CHAKRAVARTY: Can we call up Exhibit 1230-10? I believe this is in evidence.

Q. Do you recognize that?

A. I've seen the picture before, but I don't know if I've -- I believe I analyzed it in the lab in a different form. When it came into the laboratory, it had already been dismantled or taken apart.

Q. All right. Can I show you Exhibit 1256-04?

MR. CHAKRAVARTY: Which is also in evidence, I believe.

Q. Do you recognize that?
A. Yes.
Q. Does that appear to be a disassembled version of the earlier photo?
A. Yes.
Q. And what did you analyze that to be?
A. So I mechanically removed some of the powder that you can see from the different firework-type material, and the powder that was contained within is pyrotechnic, low-explosive material.
09:45
Q. If you can estimate, without precision but just as a ballpark, how many of these you would need to extract a pound of explosives?
A. It would be quite a lot, hundreds, I would guesstimate. It's really inaccurate, but it would be hundreds because there's not a lot of material. There's three different kinds. You can see there's a Roman-candle-type product up at the top. I didn't analyze that. But then you can see those from, I guess, south to north, you can see finger-type or long cylindrical-type materials. There's a couple milligrams or a gram or so of material within each of those. And then off to your left at about 9:00 or 10:00, there's more cylinders that are chained together with a fuse. I opened up one of those. There's approximately a half a gram to a gram of material within each one of those.
09:46

Q. Did you have various receipts and other exemplars of other fireworks that were purchased as part of this investigation that you analyzed?
A. Yes. One sample was sent down to us.
Q. Was there a lock-and-load mortar kit that you examined?
A. Yes.
Q. Was that the largest firework that you examined?
A. Yes.
Q. And how many of those would you need to create a pound of explosive material?
09:47
A. If I recollect correctly, the lock and load, one of those mortars contained a little bit more than 30 grams, about 35 grams of material. So, again, you would need a couple dozen of those to get up to a pound.
Q. In order to extract explosives from firework materials, can you describe how clean or dirty that process is?
A. In my experience, it's a pretty dirty process. Again, because -- when I've talked about the low explosives, oxidizers and the fuel, the most common fuel used is aluminum powder because it's cheap and it's very reactive. So that's pretty
09:47
much the go-to fuel for a lot of these firework manufacturers. But when you work with this material, it appears -- since it's mixed so well commercially, it appears to just look silver in color. You almost can't discern any heterogeneous compounds within there, like a mixture of different things, until you put

it under a microscope and start looking at it. And then you can see the many different things that go in there. But working with that, we definitely use gloves, but it's almost impossible not to get the material coating on your hands, the silver powder, which is aluminum powder or magnesium powder which may be in there as well.
Q. And if you were to use black powder as if from a propellent or as a -- or just in bulk form, how clean or dirty is that to extract and to make into a low-explosive device?
09:48 A. Black powder is pretty unique because it literally looks like very small pieces of coal. It comes in various grain sizes depending on what application the -- the people that use it for hunting or black-powder rifles. It has four different sizes. But they're very highly polished, little, irregularly shaped lumps of powder material. So if I handle that, I'll get a little bit of chemical residue on me, but it's not going to really notice -- or be able to see on my hands, yes, I just handled black powder because my hands are all black now. It doesn't work that way. It's coated with graphite to keep the 09:49 friction down, so if you're pouring it, it doesn't generate friction which could set it off.
Q. Now, as part of this investigation, you said that you had analyzed a number of bulk materials submitted as well as post-blast materials --
A. Yes.

Q. -- correct?

With regard to the bulk materials submitted, for example, in that plastic container in Watertown, was there several pounds of explosives in that container?

A. I didn't weigh out the material. It was presented to me in smaller, couple grams of material to analyze.

Q. But to create that bulk material, would you expect to see residues of that bulk material wherever it was created?

A. In that volume and that mass that was produced, yes.

09:50 Q. And if there was the same type of powder in the pressure cooker devices and the pipe bombs, then you would expect that there would be even more bulk material that would have had to have been prepared before they could have been used in those devices?

A. Yes.

Q. Again, did you, in your investigation, see traces or evidence that was consistent with a -- the volume of particles of residue that would indicate where specifically these devices were assembled?

09:50 A. No.

MR. WATKINS: I'm going to object. Very confusing.

THE COURT: Well, in light of the answer, I'll let it stand.

Q. Did you also receive in the lab for analysis trace filters from various vacuum samples?

A. Yes.
Q. And did you see -- receive those from various search locations in the investigation?
A. Yes.
Q. Was there any one set of trace filters that you received that indicated that there was a large volume of traces of either black powder or low-explosive, pyrotechnic mixture?
A. I'm going to have to refer to my report. Is that okay?
Q. Please, to refresh your recollection.
09:52 A. So there are going to be specimens Q933, that whole sequence from -- let's see here -- 410 Norfolk Street, Apartment No. 3. So the residues -- so some of the filters that I analyzed did contain residues of pyrotechnic material.
Q. So how much residue was there?
A. They contained -- again, we don't quantitate. I don't know how much residue was there. But there's the perchlorate ion. There's the nitrate -- elevated nitrates, sulfates, materials like that.
Q. So you don't -- you don't measure from the quantity of 09:53 these materials when you do the analysis? You just measure whether those materials actually exist?
A. Correct, if they're present.
Q. Aside from Norfolk Street, were there any other locations where you tested for residue? I guess the question is whether you tested for residue in other places.

A. There were some gloves that were -- some latex or some type of disposable gloves from a vehicle that contained residues as well.
Q. Was that a Honda CR-V that was parked outside of 410 Norfolk?
A. Correct.
Q. Again, was that pyrotechnic mixture on the fingertips of those gloves?
A. Yes, consistent with pyrotechnic material.
09:53 Q. Aside from that, was there anything else?
A. Some of the samples from 410 Norfolk Street. There were four samples that contained small grains of black powder as well, not just the residues of the ions, the oxidizers that we were detecting, but actual physical black powder grains were identified.
Q. Now, in a case involving as much explosives as you --
MR. WATKINS: I'm going to object, your Honor.
MR. CHAKRAVARTY: I'll ask a new question.
Q. In this case, would you expect to have seen more residue?
09:54 MR. WATKINS: I object.
THE COURT: Sustained, sustained, without foundation.
Q. Do you expect to see residue -- residues of the creation of IEDs or, Improvised Explosive Devices, when they are created in the course of --
A. Correct. In this type of operation, if material is being

extracted from fireworks and then ground up somehow, it's hard to keep a clean surface. It's hard to not contaminate or spread this material around to the surfaces or areas you're working in or getting it on your person, yourself, within your clothes and then tracking it to other areas. It's very difficult.

Q. So is it fair to say that there was at least a large --

MR. WATKINS: Objection, your Honor. Leading.

THE COURT: No. Overruled. Go ahead.

09:55 Q. -- an unquantifiable but a substantial amount of explosive powder that was necessary to create the devices on Boylston Street and in Watertown?

A. Yes.

Q. And did you find the residues that were commensurate with that volume --

MR. WATKINS: I'm going to object, your Honor. Can we be seen at sidebar?

THE COURT: Okay.

(SIDEBAR CONFERENCE AS FOLLOWS:

09:55 MR. WATKINS: He's trying to get into an opinion that hasn't been noticed. I'm not exactly sure where he's going in the long term of the guilt phase here, trying to suggest that the bombs weren't built in Norfolk or built somewhere else. I don't know what that has to do really with anything in the guilt phase. So I'm wondering about relevance on that.

I was not noticed about this particular aspect of the testimony where he's really speculating about where -- what Mr. Chakravarty is trying to do is get a conclusion that the bombs were not built at Norfolk Street through a series of questions, "wouldn't you expect." I don't know that he's going to ask that, but that certainly suggests to the jury. And on that aspect, really what he's trying to do is elicit an expert conclusion without soliciting an expert conclusion.

MR. CHAKRAVARTY: I'm not trying to elicit an expert conclusion. I'm doing two things: one is preempting what I anticipate to be a line of questioning from the defense. So I'm simply exposing what his analysis was about those trace explosives and other things that Mr. Watkins raised yesterday. So he's exposing that. And in order to provide the context of what those -- that analysis means, I'm eliciting from him the fact of the residues that he found there was a relatively small amount of residue versus the amount of explosives that he had -- the amount of explosives that appeared to have been involved. That's precisely the question I'm asking for. There's no line of questioning.

THE COURT: What about the notice issue? Was this in his report?

MR. CHAKRAVARTY: What's in his report is that there are trace amounts of the explosives and the residues, and it's -- what's not in his report is an opinion as to whether the trace amount would be proportional to the amount of explosives that may have been involved in the case because, frankly, at the time he did the report, he didn't know what the trace amount was. I'm not sure that that's an expert opinion.

THE COURT: I think it is so I'd exclude it.

MR. CHAKRAVARTY: Okay.

. . . END OF SIDEBAR CONFERENCE.)

MR. CHAKRAVARTY: Your Honor, a moment ago I showed Mr. McCollam Exhibit 1230-10, and that's part of the 2-D exhibit and it's in evidence, but it's not separately marked as such. So I would move that into evidence.

09:58

MR. WATKINS: Are we talking about the photograph?

MR. CHAKRAVARTY: The photograph.

MR. WATKINS: Then no objection.

(Government's Exhibit No. 1230-10 received into evidence.)

THE COURT: Okay.

MR. CHAKRAVARTY: Thank you, Mr. McCollam.

CROSS-EXAMINATION BY MR. WATKINS:

Q. Good morning, Mr. McCollam.

10:00

A. Good morning.

Q. Mr. Chakravarty was asking you a series of questions about other items that you tested in the laboratory for explosive residues?

A. Yes.

Q. And there was really a whole lot of items that you

analyzed? You were a very busy man in this case; is that fair to say?
A. Yes.
Q. And your report is quite lengthy and goes on to identify a whole host of items that you examined and/or tested for explosive residues, right?
A. That's correct.
Q. Showing you what's been admitted as Exhibit 3099 -- I'm waiting for it to come up.
10:01 You mentioned in your report a Q number. Exhibit 3099 is Q667. Do you see that in your report?
A. I do.
Q. What was the -- your analysis of exactly what was found on those gloves in Q667?
A. Within some of those gloves there was black smudging on some of the fingertips. So that smudging in that fingertip area, I couldn't scrape off any residue, per se, like I could with the metal fragments that were from the explosions. So I prepared an SEM slide, or an SEM stub is what it's called. So 10:02 I just take the sample holder that's utilizing the SEM instrument, and I dabbed it on the fingertip of that glove to get any residue that's off. That specimen was analyzed on the SEM. Then I did a water wash of that -- those black-tipped from the particular gloves that were within Specimen 667 and 668, actually.

Q. You told us about ions and anions that you look for when you're doing your analysis?
A. Correct.
Q. You found those on these -- this set of gloves, right?
A. I found some anions, yes.
Q. Residues detected carbon, oxygen, iron magnesium. You explained to us already that those are items that are included in low explosives?
A. They're included in some pyrotechnic formulations. They can be in some low explosives, but they're commonly found -- those, in particular, were common for firework material.
Q. Actually, those things can be found everywhere in nature, but the combination starts to suggest fireworks and pyrotechnic formulations?
A. Correct.
Q. Going on, silicone, sulfur, calcium, chlorine, potassium, barium and zinc, those are things also found when you analyzed these gloves that were found in the Honda CR-V?
A. Yes.
Q. Again, you analyzed many, many things, and for many of them you concluded there was no explosive residue, right, on many of the items that came into your laboratory?
A. Correct.
Q. But these certainly were of note because of that particular collection of elements indicated pyrotechnic

formulations, right?
A. Yes.
Q. And you mentioned -- you anticipated already 668, the same thing, another latex glove found in the CR-V. You found the same kinds of ions and anions on that glove also, correct?
A. Yes.
Q. And, again, you've analyzed a lot of different things. And if there were no collection of those elements, you wouldn't report a finding or you'd report no finding. But certainly this was of interest given those collection of elements on the glove, right?
A. Yes.
Q. Also, 671, another latex glove found in the CR-V, it was notable because it had --
MR. CHAKRAVARTY: Objection, your Honor. I think this is the same photo from the -- same glove from a different angle.
MR. WATKINS: Is it? I'm sorry. This is Q671. Maybe I hit the wrong one before.
Q. These are different, aren't they?
MR. CHAKRAVARTY: I stand corrected.
Q. 668 and 671?
A. Correct, yes.
Q. So they're two different gloves. They look very much the same, right?

A. They do, but they have different numbers, Q numbers.
Q. Which means they're different items?
A. Yes.
Q. But there was explosive powder found on each of them? I'm sorry. "Explosive" is the wrong word. There were elements on those gloves consistent with pyrotechnic formulations?
A. On 667 and 668 but not on 671, that second picture you showed.
Q. Right. 671 found chloride nitrate and sulfate items, right, according to your report?
A. Yes.
Q. That's here, 671. Not as many elements as those other items but still enough to warrant a finding in your report or at least a mention in your report, right?
A. Yes. I listed chloride, nitrate, and sulfate on those items.
Q. Because those are also consistent with pyrotechnic formulations and low explosives?
A. They can be, yes.
10:06 Q. In addition to actual items, you received vacuum filters --
A. Yes.
Q. -- to analyze, right?
A. Yes.
Q. And vacuum filters come from vacuum sweeping? There are

forensic vacuums that the FBI has for this purpose?
A. Yes, they're special filters.
Q. Special vacuums and special filters and actually written procedures about how one goes about vacuum-sweeping an area, right?
A. Those -- I'm not aware of those procedures. I'm not an ERT member, so I didn't collect any of these samples.
Q. But you do get those trace filters back to the lab and that's what you analyze?
10:07 A. Yes.
Q. There's no picture for it because it's, you know, trace filter. But Q669 is also a vacuum filter from the Honda CR-V at 410 Norfolk. Do you see that in your report?
A. Yes.
Q. Again, you identified that as having residues of chloride, nitrate, and sulfate, right?
A. Yes.
Q. Again, consistent with pyrotechnic formulations, low-explosive residue?
10:08 A. Some, yes.
Q. Finally, Q732 was a vacuum filter from a sweep of a Honda Odyssey at 410 Norfolk, the same for that contained residues of chloride, nitrate, and sulfite, right?
A. That's sulfate.
Q. Sorry, sulfate.

A. Yes.
Q. In addition to the items found -- Q667, just to go through and make it clear for the record, I showed you Exhibit 3099, which was Q667. I showed you Exhibit 3100, which is Q668. Is that correct?
A. Yes.
Q. And then Exhibit 3101, this is a second picture -- not a second picture -- a picture of a second glove, which was Q671, is that correct?
10:09 A. Yes.
Q. Have you also analyzed a set of tools and other items that were denoted Q725? It was a box of tools and other things that was admitted yesterday as Exhibit 1094.
A. Yes. Q725 I analyzed.
Q. I'm sorry?
A. Yes. I analyzed Q725.
Q. What that involves is a lot of different items that were found in a drawer at 410 Norfolk?
A. Yes.
10:10 Q. There were two items on that that also included evidence of low explosives?
A. Yes.
MR. WATKINS: Your Honor, I don't think this is in evidence, so perhaps we can go just to the witness.
Q. Showing you a picture of 725.11, is that one of the items

that you analyzed?
A. Yes.
Q. That is a picture -- do you recognize that as a picture that you looked at because it was taken in the Quantico laboratory?
A. Yes.
MR. WATKINS: I'd seek to admit Exhibit 3102.
MR. CHAKRAVARTY: No objection, your Honor. I think it may also have a government exhibit number.
10:11 (Defendant's Exhibit No. 3102 received into evidence.)
MR. WATKINS: Is it? There you have it. May we publish that?
THE COURT: Yup.
Q. And that -- it's a hobby fuse, right?
A. That's one of the names -- common names for it, yes.
Q. And there are traces of potassium perchlorate and carbon on the hobby fuse?
A. Not traces. There's actual bulk explosive -- low-explosive material that is contained within the core of
10:12 that. You can't see it on the outside, but it's contained with the inside of it.
Q. I want to direct your attention to Q725.24. Now, there's not a separate picture of that item, but that would be --
THE COURT: Is this in evidence? It's all part of the interactive anyway, I think. It was shown in that. I don't

know that it was separately marked. Any problem showing it to the jury?

MR. CHAKRAVARTY: No, your Honor.

THE COURT: Okay.

MR. WATKINS: May I have just a moment?

Q. Anyway, this picture that's up before you with a red circle around a lid, did you analyze that black lid?

A. I analyzed the lid, yes.

Q. I'm sorry. Analyzed the lid with the black residue on it?

10:13 A. Yes, sir, I did.

Q. And that was notable for high explosives, nitroglycerin, on it, right?

A. Correct. Nitroglycerin is a high explosive.

Q. You told us about smokeless powder. These items were consistent with smokeless powder?

A. Right. The residues that I detected on that can lid contained nitroglycerin and another chemical called ethyl centralite. Those two chemicals are commonly found in some smokeless powder formulations. It will be a double-based smokeless powder.

10:14

Q. Again, I'm told this picture was introduced as Exhibit 3066 yesterday. This picture is in evidence. And it is a collection of items that you understand through your notes was collected at 410 Norfolk, in a drawer, right?

A. Correct.

Q. You received vacuum filters for analysis sometime in July or August of 2013? I would be referring to Q1283 through 1293.
A. Yes.
Q. When did you receive those items?
A. I don't recall the exact date that I received them, but they came into the laboratory -- because when evidence comes into the laboratory, it's assigned a unique identifying number. It appears that those came in August 16, 2013.
Q. And these were more vacuum filters, right, for analysis?
10:15 A. Q1283 through Q1291 were vacuum filters. Q1292 was a vent filter. And then I believe you said 1293 -- you said Q1293 were swabs.
Q. In your report, you have those identified with particular locations where they were from, that they had been collected from?
A. When the evidence is inventoried within the laboratory, they just have a disclaimer stating where these items were collected from. I don't know where they're collected from other than what somebody tells me.
10:16 Q. Right. What were you told that -- where they were collected from?
MR. CHAKRAVARTY: Objection, your Honor.
THE COURT: Overruled.
MR. WATKINS: Sorry?
THE COURT: Overruled. You may have it.

A. The following items were recovered from UMass Dartmouth, Pine Dale Hall, Room 7341, North Dartmouth, Massachusetts, by FBI Boston.
Q. So, again, these are vacuum filter traces consistent with the kinds of evidence you would get if somebody had vacuumed up an area and sent it to you for analysis?
A. Yes.
Q. And you analyzed all of those vacuum filters?
A. Yes.
10:17 Q. Did you find any of the traces that you talked about with the jury as being indicative of pyrotechnics?
A. No. The screening technique showed that they were negative for any typical explosive residue traces that we screen for.
MR. WATKINS: That's all I have, your Honor.
MR. CHAKRAVARTY: Very briefly, your Honor.
REDIRECT EXAMINATION BY MR. CHAKRAVARTY:
Q. Mr. McCollam, you testified that there may have been pounds of low explosives that were used in this case?
10:18 A. Correct.
Q. And you testified that it's an extremely messy process to create those low explosives?
A. Yes.
Q. And as far as you know, with regards to the trace amounts of low explosives that Mr. Watkins asked you about, you found

them on some gloves, and you found some in some vacuum filters from 410 Norfolk Street?

A. Yes.

Q. And that's the only trace amounts that you found in this case; is that fair to say?

A. Yes.

Q. And unlike trace amounts of explosive product, there was actually intact fireworks found in the dorm room in Pine Dale Hall, isn't that right?

10:18 A. If it was submitted to the laboratory coming from there, I analyzed it, so, yes, there were.

Q. And in the landfill, there was a bag containing intact amounts of low-explosive, pyrotechnic mixture?

A. Yes.

Q. Did you ever find a location, a single location, where there was a production facility for these IEDs?

MR. WATKINS: Objection, your Honor.

THE COURT: Sustained.

MR. CHAKRAVARTY: That's all I have, your Honor.

10:19 THE COURT: Anything else?

All right, sir. Thank you. You may step down.

. . . END OF EXCERPT.)

C E R T I F I C A T E

I certify that the foregoing is a correct transcript of the record of proceedings in the above-entitled matter to the best of my skill and ability.

/s/Cheryl Dahlstrom   April 28, 2015

Cheryl Dahlstrom, RMR, CRR   Dated

Official Court Reporter