

## Forensic Evidence Cited by the OPCW that Contradict Its Reported Analysis and Conclusions

### Forensic Analysis of More Than 250 Videos and Satellite Imagery

The image below is extracted from a video cited as evidence in the UN report. The video was posted on YouTube on April 5, 2017, one day after the alleged nerve agent attack at Khan Sheikhoun on April 4, 2017. The citation is as follows: [https://www.youtube.com/watch?v=sinGDpQ27\\_I](https://www.youtube.com/watch?v=sinGDpQ27_I)

This is one of many video clips of a dead goat that is discussed by UN investigators of the Khan Sheikhoun attack. The exact location of the goat is readily determined from both drone images and an extensive video clip where an individual is followed as he walks from the crater to the location of the goat. These videos show details of the goat's face that show foaming from the nostrils and mouth – classic (although not necessarily unique) symptoms of sarin poisoning. In all of the videos of the scene around the goat, tracks associated with the carcass being dragged to that location can be seen. Additional videos show the goat had a rope tied around its neck that is attached where it would be expected if the carcass was dragged by the rope to the location.

The aerial photograph at the top of the next page shows the location of the goat carcass and crater that was allegedly the source of the sarin release at Khan Sheikhoun. This photograph was taken by a drone equipped with a video camera very shortly after the attack. Images in this video show that the spent rocket motor of the artillery rocket in the crater had not yet been bent backward and laid flat at the center of the crater relative to its original position immediately after impact. As will be shown later in images and explanations, the spent rocket motor was carried forward by momentum into the crater that was produced by the exploding warhead in front of it. The front end of the spent rocket motor penetrated the earth suddenly stopping its forward motion. The back end of the spent artillery rocket motor remained free to continue moving in the forward direction, resulting in the empty rocket motor casing being bent and oriented along the line of the rockets arrival trajectory. This clearly observable mechanical phenomena is revealed in detail in the videos produced from our supercomputer calculations and is discussed later in this report.



The UN report itself acknowledges that rebel groups have access to methylphosphonyl difluoride that has markers indicating it was produced by the Syrian Arab Republic. This is the key material for producing sarin.

Given that it is known and acknowledged that rebel groups have access to sarin, the fact that a goat carcass was dragged to the location of the crater could indicate evidence of staging of a sarin attack by rebel elements.

This could have been implemented by confining the goat to a small room. No more than a few drops of sarin from an eyedropper would be needed to kill the goat and other animals or people confined to the room. If this was done as part of an effort to stage a sarin poisoning at the site of the crater, the poisoned goat could be accompanied by birds, other animals, and even human victims that were deemed as enemies of the rebel occupation.

The OPCW reports that sarin was detected on goat hairs taken from the scene. This is exactly what would be expected whether or not the goat was poisoned by sarin exposure at some other place or at the scene.



The image below is taken from another video cited by the OPCW investigators. This cited video was also posted on YouTube on April 5, 2017. This video can be found at: <https://www.youtube.com/watch?v=cyteQV82YN8>. It shows two dead birds at the bottom of a birdcage that has seeds and bird droppings at the bottom of the cage, indicating that birds were living in the cage.



This video should have raised questions about why dead birds would be collected at the scene of a sarin attack and from a cage where it appears the birds were actually living. There are also other video sequences showing an individual removing the birds from the cage and putting them into plastic sample bags. There are also video images of the carcasses of the two dead birds in plastic bags in the box of samples from the area around the crater (these videos and images can be made available to UN investigators on request). Not surprisingly, the OPCW investigation found evidence for sarin on the bird's feathers and in their internal organs. The detection of sarin on the bird's feathers and internal organs is certainly proof that the birds were exposed to sarin, but it is not proof that the birds were exposed to sarin at the crater.

As will be demonstrated later in this series of examples of forensic evidence, the crater was produced by the explosion of an improvised artillery rocket, and the metal pipe in the crater is shown to be the spent rocket motor from that rocket. If this is actually what occurred, no sarin would have been released from this crater and all of the evidence of sarin from the dead animal samples would be highly suspect for having been staged.



The next image below is extracted from a video cited as evidence in UN report that can be found at the URL [https://www.youtube.com/watch?v=sinGDpQ27\\_I](https://www.youtube.com/watch?v=sinGDpQ27_I). Note that the two men collecting samples at the crater on April 5, 2017 are wearing sandals and facemasks that provide no protection against sarin vapor. The UN investigators concluded that between 200 and 350 liters (L) of sarin were dispersed at this site roughly one day earlier.

This is an enormous amount of sarin, comparable to the amount of sarin that was delivered by multiple rockets in the nerve agent attack in Ghouta on August 21, 2013.

This large amount of that sarin would have been deposited in the dry soil shown in the image below, which was taken only one day after this enormous release. Because the underlying soil is cooler than the air, sarin liquid and vapors will be trapped in the soil for days after such a heavy deposition. In the cooler underlying soil, sarin vapor will be in chemical equilibrium with trapped liquid sarin, and evaporation will be extremely inhibited, causing the material to remain in place for long periods of time (potentially days in the case of a large release of the type alleged by the UN report). Digging into this sarin-soaked soil would simply expose soil particles covered with sarin liquid to the air, resulting in thin layers of sarin on small particles that would evaporate into the air at a high rate. As a result, it is simply impossible that an unprotected individual could dig such sarin laden soil from the crater only one day after a massive delivery without suffering serious consequences, probably even death from exposure. It is implausible that experienced true experts at the UN would have this video-evidence and not recognize the problems raised with the credibility of the conclusion that hundreds of liters of sarin had been deposited at that location only a day earlier



The image below is from one of the many videos showing Turkish ambulance personnel who were dispatched to help with the injured at Khan Sheikhoun. The OPCW report refers to video showing the Turkish ambulance personnel. All of the ambulance personnel have light hazmat protection to minimize exposure to highly toxic sarin that could be still evaporating from exposed victims. These protective measures include hoods, gloves, foot coverings and respirators designed to trapped vapors. This particular image was chosen because it shows that the Turkish personnel were equipped with gas masks that had filters against vapor. Contrast this with individuals at the crater who have taken almost no special precautions to protect themselves from vapors and the deposition of liquid sarin on their skin or clothing.



When the information indicated by these images of events surrounding the alleged sarin attack at Khan Sheikhoun of April 4, 2017 was reviewed by the OPCW, it should have raised at least some questions about whether or not the release of sarin at the crater was staged. Alternatively, it should have also raised serious questions about the conclusion that such massive amounts of sarin were deposited during an attack.

When the OPCW investigators contemplated the possibility that 200 to 350 L of sarin were delivered at this site, they should have reviewed this video evidence yet again. This video evidence should have raised questions about whether so much sarin could have been deposited at the crater and not resulted in serious injuries or death to exposed workers at that site working only one day later.

## The Unambiguous Science-Based Forensic Evidence That the Crater the JIM Alleges Was the Source of a Sarin Release Was Actually Produced by the Arrival and Detonation of an Improvised Explosive-Armed Artillery Rocket

In this section we describe the evidence and key concepts that lead to the conclusion that the crater was produced by the detonation of an artillery rocket warhead near the ground. This evidence also shows that the JIM report could not have been produced, or just as importantly, reviewed, by any true experts on explosive munitions and their effects. As pointed out in the annotations of the 26 October 2017 report, essentially none of the assertions about munitions and munitions effects are correct.

The image below is from the UN manual *Verification of Minefields, Explosive Remnants of War and Crater Analysis*. This UN manual provides critical potentially life-saving information to UN peacekeepers about how to identify the direction from which artillery rockets or artillery shells are being fired. It is a piece of information that UN peacekeeping soldiers in the field would need to know. This same information can also be found in US Army Artillery Officer Field Manuals. As such, it is to be expected that anyone with field knowledge of munitions would immediately recognize that the shape of the crater could show the direction from which hostile rocket or artillery fire is coming.

**UN Manual:**

### Verification of Minefields, Explosive Remnants of War and Crater Analysis

Section 1.2 Verification of minefields, explosive remnants of war and crater analysis Pg. 1

#### Section 1.2 Verification of minefields, explosive remnants of war and crater analysis

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UN Peacekeeping PDT Standards, Specialized Training Material for Military Experts on Mission 1<sup>st</sup> Edition 2010

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#### TYPES OF CRATERS

Types of Craters	
• Low-Angle Fuze Quick Craters (Artillery)	Slide 21
• Low-Angle Fuze Delay Craters (Artillery)	
• High-Angle Shell Craters (Mortars)	

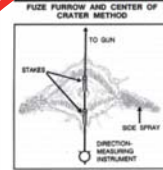
**LOW-ANGLE FUZE QUICK CRATERS (ARTILLERY)**

The detonation of a low-angle fuze quick projectile causes an inner crater. The burst and momentum of the shell carry the effect forward and to the sides, forming an arrow that points to the rear (toward the weapon from which the round was fired). The fuze continues along the line of flight, creating a fuze furrow. There are two methods of obtaining a direction to a hostile weapon from this type of crater. These are the fuze furrow and center of crater method and the side spray method. The best results are obtained by determining a mean, or average, of several directions obtained by using both methods.

Fuze Furrow and Center of Crater Method

**Fuze Furrow and Center of Crater Method**

FUZE FURROW AND CENTER OF CRATER METHOD



- Place a stake in the center of the crater.
- Place a second stake in the fuze furrow.
- Set up a direction-measuring instrument in line with the stakes and away from fragments.
- Orient the instrument.
- Measure the direction to the hostile weapon.

**Fuze Furrow and Center of Crater Method**

The fuze furrow and center of crater method, one stake is placed in the center of the crater and another is placed in the furrow at the point where the fuze was

UN Peacekeeping PDT Standards, Specialized Training Material for Military Experts on Mission 1<sup>st</sup> Edition 2010

**UN Explanation of How to Identify and Determine the Direction of Rocket or Artillery Fire from Shape of Crater**

The diagram in the UN Field manual indicates the shape of craters that are produced by munitions that contain cylindrical explosive charges with a high ratio of length to diameter. This is the geometry of explosive charges associated that are carried by artillery rockets or fired by artillery.

The image below is a photograph of the crater that the JIM alleges was the source of a sarin release at Khan Sheikhoun. This photograph of the crater at Khan Sheikhoun is extracted from a video that was taken from a drone. This video was available on YouTube and was also referred to in the JIM report.

Note that the rim of the crater has a "tear -shape," which is essentially the same shape as the crater rim described in the UN Field manual. The Field manual indicates that the narrow end of the crater points in the direction of the artillery rocket fire. We will shortly describe the scientific facts about what causes this classic shape.



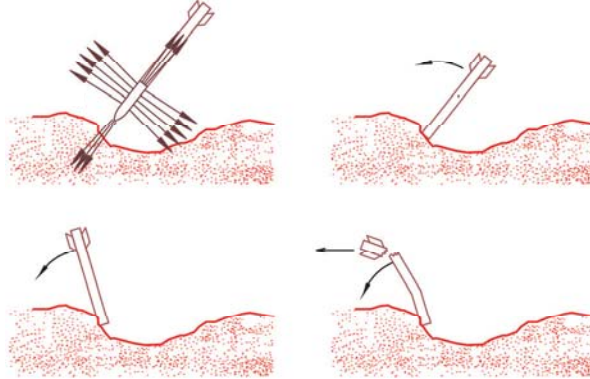


The image below shows a panoramic composite constructed from multiple video frames taken by the drone that took the picture of the tear-shaped crater immediately above. The panoramic image shows that there are two additional craters of roughly the same size as the crater on the road. Two of the craters is in a grassy open field. There is also evidence of damage to the supporting structure of one of the concrete slabs on the roof of the grain storage warehouse. It is not evident from this photograph that this damage occurred during the same rocket attack, but an inspection of the before and after satellite photographs for this location shows that this damage appeared at the same time as the three other craters. All four impact points fall along the same direction of arrival, as determined by the shape and orientation of the rim of the crater that is alleged to be the source of the sarin release.



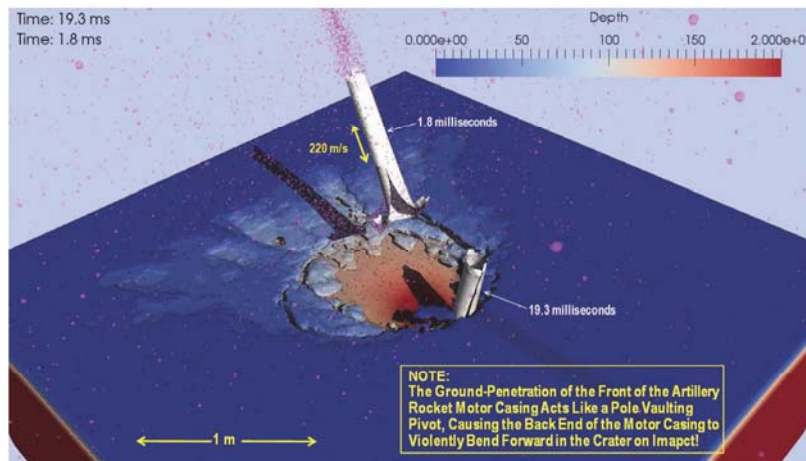
Our supercomputer calculations showed that an explosive charge in the shape of a cylinder with a large ratio of length to diameter detonated near the ground at an angle of roughly  $45^{\circ}$  to  $65^{\circ}$  relative to horizontal would produce exactly the same type of tear-shaped crater as that described in the UN and US Army Artillery Officer Manuals. The conceptual picture of what we found is shown at the top of the next page in a sequence of four panels. In the upper left panel, the rocket is shown arriving at the surface of the ground where the warhead detonates. Because the explosive charge is relatively long and thin, the reflected shock pressure from detonating explosive near the front-end of the munition at the ground will be 50 to 100 times higher than the reflected shock pressure at the ground from the detonating explosive at

the back end of the munition and above the ground. This very large difference in reflected shock pressure results in the crater being deepest at the point of impact. This asymmetrical shape is a fundamental result of a long narrow charge detonating at the shown angle relative to horizontal. The crater is formed almost instantly relative to the time it takes the empty rocket motor to move forward under the influence of momentum. Our calculations show that the empty rocket motor is first carried forward by momentum into the already formed deep front of the crater. The front wall of the crater then acts like a pole vaulting pivot, causing the back end of the motor casing to violently pitch forward. Our supercomputer calculations predict that the forward pitching of the empty rocket motor is so violent that it bends the motor casing in the forward direction. This sequence of events is shown in the cartoon below.



Reflected shock pressure on the ground from detonating explosives near the front-end of the munition could easily be 50 to 100 times higher than the reflected shock pressure on the ground from the detonating explosives at the back end of the munition.

The image below shows actual results from our supercomputer calculations. The location of the rocket motor is shown 1.8 ms and 19.3 ms after the detonation of the warhead. The crater has already been formed by the detonation of the explosive warhead. The rocket is arriving slowly, 220 m/s, relative to the time it takes the detonating warhead to form the crater. The long cylindrical charge is at an angle of  $65^\circ$  when it detonates. The warhead weight is 18.2 kg, with 8.1 kg of explosive and 10.1 kg of metal casing. The total weight of the spent rocket is 27 kg rocket.



The ground-penetration of the front of the artillery rocket motor casing acts like a pole vaulting pivot, causing the back end of the motor casing to be violently bent forward

As can be seen by inspecting the image, during the 17 ms following the first shown position of the arriving empty rocket motor, the motor penetrates into the ground at the front end of the crater and flips forward from the pivot created by the front wall and penetrated ground. We emphasize that this image is generated from a first principles supercomputer calculation.

The photograph below is of the crater at Khan Sheikhoun before extensive tampering with the crater had occurred. We were able to determine the relative time at which the photographs of the crater were taken by carefully analyzing the breakup of the edge of the crater from people entering and leaving the crater. This photograph is one of the very early photographs of the crater.

Note that the pipe in the crater is embedded deeply into the front end of the crater as predicted by the supercomputer calculations and it is bent forward also as predicted by the supercomputer calculations.

There is circular cap that can be seen in the crater. This cap has been the entire focus of the discussion in the JIM. The forward twisted embedded pipe is never discussed in any detail in the JIM and it is never even referred to in the JIM as a pipe. The Jim universally refers to the bent pipe as a "metal object."





According to the JIM, this metal object was formed from the thin-wall of a sarin-containing bomb that had a diameter of roughly 300 to 500 mm. That is, according to the JIM, a sheet of thin-walled metal from a cylindrical bomb of diameter 300 to 500 mm was rolled up into a pipe of roughly 122 mm uniform diameter, stuck vertically into the ground immediately behind the front wall of the crater, and bent forward after being rolled up and stuck vertically into the front of the crater. We know of no physical sequence of events that could possibly result in this endpoint that could be produced by a mechanical calculation of the type we have already done.

A bomb striking the ground as postulated by the JIM would have an impact speed of roughly 220 to 250 mph (300 to 400 km/h). This speed is similar to speeds where racing cars can hit a retaining wall. Just like in the case of a racing car, metal is not shattered at these speeds but simply gets torn into large pieces.

The image below shows an example of the kind of debris that is left behind by the "metal object" that hit the ground at a speed of 200 to 300 mph. In this case the object was a barrel containing sarin that was launched by a 122 mm rocket motor that was used to propel the barrel of sarin to a range of about 2 km. Many images of the rockets that were used in this particular attack from August 21, 2013 in Ghouta, Syria, show exactly what would be expected from the impact of a bomb as argued by the JIM. The debris would consist of the front and back ends of the barrel, which must be made of relatively thick metal to provide physical strength for holding the sarin, and in the case of a bomb, a very robust tail section to provide aerodynamic stability. All of these pieces of material should be strewn in and around the crater if the crater was actually produced by such a bomb impact. Our conclusion is that the small metal cap that was the entire focus of the JIM analysis was simply planted at the scene, probably at about the same time the dead goat poisoned with sarin was dragged into place. All of the other evidence fits together in a perfectly sound science-based explanation of the shape of the crater, the location of the spent rocket motor casing, and the fact that the rocket motor casing is bent in the forward direction exactly as predicted by the supercomputer calculations. Since there is as shown in other images evidence of tampering with area around the crater, we conclude that the cap is, like the carcass of a dead goat that was dragged to the location, just another example staging at the crater.



**Before and After Satellite Imagery from Khan Sheikhoun that Was Not Correctly  
Reported by the UN OPCW to the UN Security Council**

As noted in the earlier section, all of the evidence indicates that the crater at Khan Sheikhoun was produced by an artillery rocket rather than an air-dropped bomb that hit the ground at high speed.

As shown from the video taken by a drone discussed in the previous section, the JIM did not discover two additional artillery rocket craters that were produced when the crater on the asphalt covered road was produced. These two additional craters were roughly 150 and 180 m from the crater on the asphalt road. Instead, the JIM gave exclusive attention to the crater in the asphalt road. The JIM also failed to identify the damage to the concrete roof panel of the adjacent grain storage warehouse from the impact of yet a fourth rocket that hit at the same time as the three other rockets. The roof damage on the warehouse was roughly 135 m from the exclusively studied crater in the asphalt covered road. The JIM investigators emphasized that before and after satellite photographs starting with satellite imagery taken on April 3, 2017 provided them with key evidence that showed that the crater at Khan Sheikhoun was produced on April 4, 2017. Yet they failed to report to the UN Security Council three other rocket impacts that occurred at the same time and were evident in the satellite imagery to anyone who cared to look.

The before and after satellite images shown below show the three craters that were produced at the same time and the damage to the roof of the warehouse from a fourth rocket hit. These three craters and roof damage further support the conclusion that they were all created by the detonation of explosively armed artillery rockets that were launched from the same location



The image on the next page shows the estimated direction of the launch points of the three rockets. Assuming the rockets were launched from a range of roughly 5 km, the offset in the arrival trajectory of the two craters produced northeast of the crater on the asphalt road can simply be explained as due to an error in the launch azimuth of roughly  $0.6^\circ$ . Given that these rockets were improvised, such an error in the launch azimuth is quite plausible.





The images below show how we use the typical Artillery Officer Field Manual technique for determining the direction of the line of fire associated with the arriving artillery rocket warhead.



The image at the bottom of the last page and the array of images immediately above this paragraph show how the direction of the artillery rockets was determined from the available image data. The three images in the left column of the above array show views of the crater taken from the drone from various altitudes. The three images on the right of the array have overlays of the UN rocket artillery crater that provide an estimate of the arrival direction of the explosive rocket. The image on the bottom right panel has been overlaid (resized and rotated) on top of the image at the bottom of the last page. By matching the size of the image and the lines of the road and walls we obtain the direction of the rocket fire. Using the standard method for reporting wind directions, where wind to the south is 0° and wind to the north is 180°, we measure the direction of the fire to be at about 236°.

In summary, the JIM did not report evidence derived from satellite imagery to the UN Security Council that would have raised serious questions about the JIM's conclusion that a single bomb carrying sarin was dropped on the asphalt road. If this information had been provided to the Security Council, it would have indicated that for explosive munitions had impacted the ground at about the same time. One of points of damage was only about 150 m east northeast of the asphalt crater that was the exclusive object of study by the JIM, the other was about 180 m east northeast, and the third was roughly 135 m to the east.

However, all of the evidence shows that the crater on the asphalt road was produced by the explosion of an artillery rocket warhead. The three other hit points are roughly on the same line of arrival as that indicated from an analysis of the crater on the asphalt road. What is disturbing in this case is that the JIM used satellite imagery to report to the UN Security Council that the crater in the road was produced on April 4, 2017 but did not provide the UN Security Council with the more critical information that there were three other munition hit points. This information would have clearly raised questions about the final conclusions the JIM provided to the UN Security Council.



## *Forensic Evidence Cited by the OPCW that Contradict Its Reported Analysis and Conclusions*

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As already discussed, the JIM provided the UN Security Council with information about only one of four munition hit points that were clearly visible in the satellite imagery the JIM states it analyzed. This oversight is of extreme importance, as it undermines the conclusion provided to the UN Security Council by the JIM that there was a single crater produced by a single bomb dropped by a Syrian aircraft. The three other munition hit points undermine the theory of this finding. All of the evidence instead points to a crater produced on the asphalt covered road by the explosion of an artillery rocket warhead. The other three munition hit points fall roughly on the same line of direction as that indicated by analysis of the shape of the rim of the crater on the asphalt surface. As will be seen in the next section, this is not the only satellite imagery that was not accurately described in the JIM report to the UN Security Council.



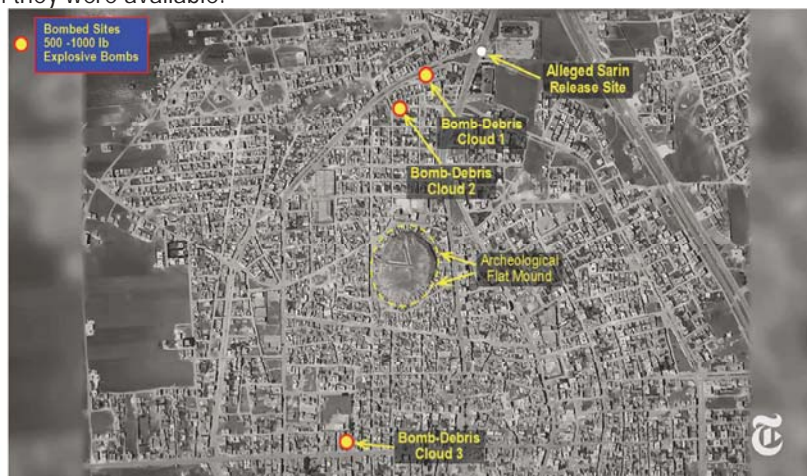


## Before and After Satellite Photographs of Bomb Damage Cited by the JIM that Show No Evidence Bomb Damage

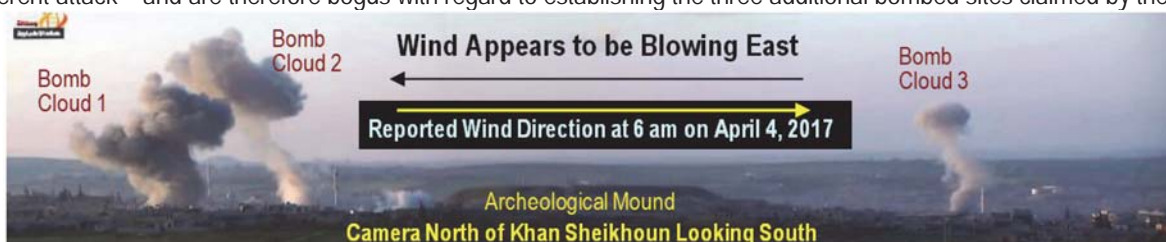
This section uses the data cited in the JIM report to show that the forensic data used by the JIM does not support the claim that there were three additional locations bombed on April 4, 2017 in Khan Sheikhoun. We emphasize that the photographic information shown and described in this section are directly cited in the JIM report.

We also note that the data indicating bomb damage cited by the JIM shows clear images of bomb debris clouds that indicate explosions from bombs of substantial weight, 250 to 500 kg (500 to 1000 pounds). As shown in the imagery presented in the last section, ground damage from a munition with a smaller charge of 6 to 10 kg can potentially be seen in commercial satellite imagery, yet we will show there is absolutely no evidence of any kind of bomb damage in the before and after satellite imagery cited by the JIM as evidence of attacks on additional targets.

The image below shows the four sites where the JIM concludes that bombs were dropped on April 4, 2017. The site where the Sarin release allegedly occurred is labeled along with the three other sites that the JIM reports were bombed with explosive bombs. The JIM states that there is observable evidence that at least some of these bombs were thermobaric or fuel air explosives. The JIM states that satellite photographs taken on April 3, 2017 establish that the crater where the alleged sarin release occurred was produced on April 4. The other three sites are identified by the JIM from studies of videos of bomb debris-clouds that the JIM claims were taken on the morning of April 4 during the attack. The before and after satellite photographs that the JIM refers to as containing evidence of the damage from explosive bombs are from February 21, 2017 and April 6, 2017 – leaving 44 days between the before and after satellite images. We do not understand why the JIM did not use satellite images from April 3, 2017, as according to the JIM they were available.



The JIM states that they found the locations of the three other bombed locations from images of bomb-debris clouds taken during the attack on April 4, 2017. The image below is a composite constructed from one of the videos that the JIM refers to. The videos were taken from a location north of Khan Sheikhoun looking south. The archaeological mound at the center of the city along with prominent minarets provides excellent references that establish the lines of sight for the camera. The JIM asserts that they are highly confident that this particular video was taken on April 4, 2017. However, as can be seen from the drift-direction of the debris-clouds, the wind is going in the opposite direction from that reported by weather services. The JIM claims that wind direction data was not available for Khan Sheikhoun on April 4, 2017. This claim is not correct. Wind data for the entire earth is available on a grid of roughly 10 to 15 km in resolution. This wind data is derived from ground stations, satellite sensors, and very comprehensive atmospheric models that include terrain features along with measured data on atmospheric pressures. These models, along with the copious data from ground stations and remote sensors, make it possible to use the laws of fluid dynamics to determine the wind direction and speed at any location on the surface of the earth within a resolution of 10 to 15 km. The estimates of wind speeds close to the ground are problematic, but this is not the case for wind speeds at 50 m or higher above the ground – where the motion of the debris clouds are clearly observable. As such, we conclude from this data that the videos of debris clouds allegedly used to identify the locations bombed sites are from a different day and a different attack – and are therefore bogus with regard to establishing the three additional bombed sites claimed by the JIM



## Forensic Analysis of How the JIM Alleges It Located the Bomb Damage

The image below shows the details of how the JIM used spuriously identified video-images of debris clouds to find the bogus bombed locations.

As can be seen from inspecting the alignments of the locations and the camera line-of-sight, the flat mound and debris-cloud locations 1 and 3 are aligned. However, debris-cloud 2 is badly out of alignment with the other objects. This lack of registration between the alleged bombing locations and the camera line-of-sight is another very strong indication that the analysis of the panoramic view is not consistent with the asserted claims about the locations of the bombings and bomb damage from on April 4, 2017.



The Jim claims that it used before and after satellite imagery to determine the locations where bomb damage occurred. These locations were found by searching before and after satellite photographs of Khan Sheikhoun along the lines of sight established from the bogus video of bomb debris clouds. A careful examination of the line-of-sight associated with this process shows that Site 2 is not correct – and any indications of damage at the Site 2 location where the JIM used satellite before and after photographs to determine the existence of bomb damage cannot possibly be correct. As will be evident from the before and after satellite images of the bombed sites, there is no evidence of ground damage of any kind at any of them – therefore rendering this observation as yet another example of the inconsistencies between the evidence cited by the JIM and the facts that emerge from examination of the bogus forensic evidence cited extensively through the JIM report.



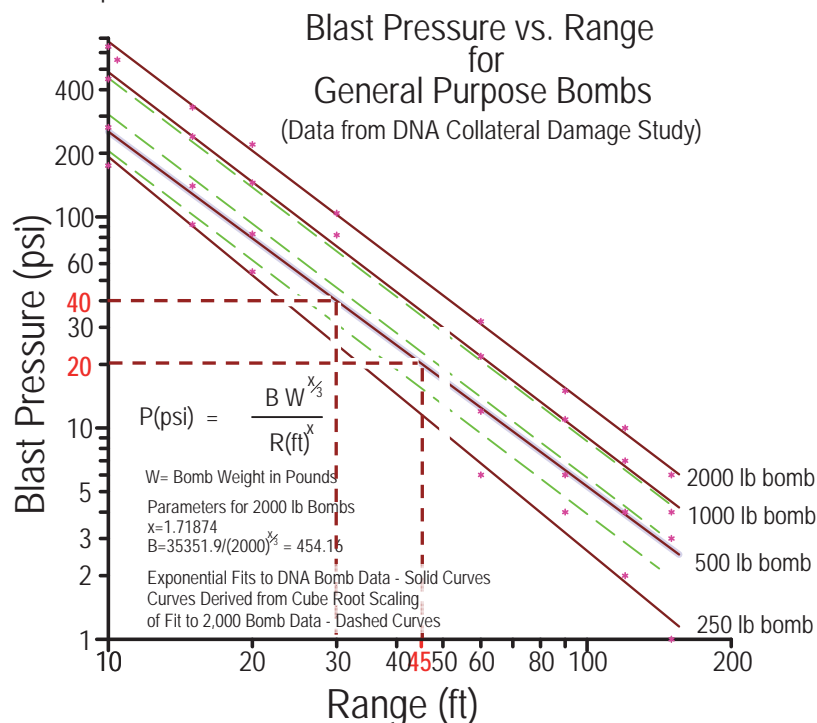
### NO Evidence for the Three Additional Bomb Attacks on April 4, 2017

In preparation for examining the before and after satellite photographs, it is useful to have some general information on the scale of damage from one or several 500 pound bombs as would be seen in a satellite photograph.

The four images below show the explosion of a German 500 pound bomb from World War II that was discovered in London in March 2017. A bomb of this size will shatter reinforced concrete walls in a roughly circular of roughly 20 meters diameter and will completely demolish buildings constructed of brick or rock supporting walls within a circle of 50 m diameter.



The graph below shows measured and fitted incident blast overpressure data versus range for US general-purpose bombs of various weights. As can be seen by inspecting the graph, a 500 pound (250 kg) explosive bomb produces an overpressure of about 30 psi (200 kPa) at a range of about 35 feet (10 m) from the detonation point. Half of the weight of such a "standard" explosive bomb is explosives and the rest is metal casing. The large weight of the metal casing is by design, as the high-speed metal fragments from the bomb can create considerable damage at ranges well-beyond where blast overpressure is effective.



**No Evidence in the Satellite Photos of Bomb Damage at Site 3**

The photo on the right shows the bomb debris cloud labeled Cloud 3 in the panoramic image constructed from the video that the JIM concludes was taken on the day of the attack at issue, April 4, 2017. The cloud "Site 3," was produced by a single 500 or 1000 pound bomb (most likely a 500 pound bomb). The location of Site 3 is shown on the map at the beginning of this discussion of bomb damage. The panoramic cited by the UN JIM is one of three debris clouds, all of which are moving slowly to the east, in a direction opposite to that of the wind direction reported for Khan Sheikhoun on April 4, 2017. The JIM refers to satellite photographs taken on February 21 and April 6, 2017, shown in the next three images, that it claims show bomb damage from these attacks.



The photo on the right shows before and after satellite photographs cited by the JIM as evidence of alleged bomb damage at Site 3. Since the distant debris cloud observed in the panoramic indicates a single bomb detonated at this site, the bomb damage might be evident as a large area of rubble where a building was initially standing. A very careful review of these photographs indicates no evidence of significant piles of rubble anywhere a building was standing.



The small yellow circles show the location where the JIM investigation concludes that there was bomb damage from the attack on Site 3 that took place on April 4, 2017. As noted in the label laid over the post-bombing satellite photograph taken on April 6, 2017, the JIM claims that the area of damage designated by the yellow circle is the result of damage that was associated with the bomb-debris cloud shown in the photograph at the top of this page. As already noted, that bomb debris cloud is typical of a cloud produced by 500 pound bomb, but a 1000 pound bomb cannot be ruled out as well.



The before and after satellite photographs on the right show a rough estimate of the area of buildings that would be reduced to rubble by the detonation of a 500 or 1000 pound bomb after it hit the building identified by the JIM. 44 days passed between February 21 and April 6, 2017. The JIM states that it also obtained satellite photographs on April 3, 2017, which it used to determine that the crater where it claims there was a sarin release was produced on April 4. Those same satellite photos should be available to determine the before and after situations on the ground one day apart. One of the many mysteries associated with the JIM report is why these before and after satellite photographs were used when photographs were supposedly available only one day apart. In any case, these photographs show no evidence of a field of rubble in place of the building that was supposedly hit.





**No Evidence in the Satellite Photos of Bomb Damage at Site 2**

The photo on the right shows the bomb debris cloud labeled Cloud 2 in the panoramic image constructed from the video that the JIM concludes was taken on the day of the attack at issue, April 4, 2017. As shown from the construction of the line-of-sight data, "Site 2" is not along the direction where the JIM claims to have found bomb damage in the before and after satellite photos. That is, the location of Site 2 as found by the JIM cannot be correct. In addition, the bomb-debris cloud is drifting to the east, which is opposite to the wind direction reported for Khan Sheikhoun on April 4, 2017 by global wind direction services.



The photo on the right shows before and after satellite photographs of the alleged bomb damage at Site 2, which is not along the line of sight indicated by the panoramic view allegedly used to find this bombing location. A very careful comparison of these photographs shows no indications of destroyed buildings or bomb craters.



The small yellow circles show the location where the JIM investigation concludes that there was bomb damage from the attack on Site 2 that took place on April 4, 2017. As noted in the label laid over the post-bombing satellite photograph taken on April 6, 2017, the JIM claims that the area of damage designated by the yellow circle is the result of damage that was associated with the bomb-debris cloud shown in the photograph at the top of this page.



The before and after satellite photographs on the right show a rough estimate of the area of buildings that would be reduced to rubble from an attack where a 500 pound bomb hit the building identified by the JIM. In this case, the building is not only still standing after being hit by a 500 pound bomb but it is also not in the line-of-sight determined by the panoramic view of the attack allegedly used by the JIM to locate the bomb damage from the attack. One of the many mysteries associated with the JIM report is how these before and after satellite photographs could also provide evidence that thermobaric or fuel air explosive bombs were dropped at some of the locations.





**No Evidence in the Satellite Photos of Bomb Damage at Site 1**

The photo on the right shows two of the three the bomb debris clouds that were videoed from a location north of Khan Sheikhoun looking South. The cloud on the left, labeled "Site 1" was produced by two or three 500 pound bombs dropped together. The location of Site 1 is shown on the map at the beginning of this discussion of bomb damage. The UN JIM found that this was the location of one of three sites that were also bombed during the April 4, 2017 attack on Khan Sheikhoun. The JIM refers to satellite photographs taken on February 21 and April 6 that show the bomb damage from these attacks.



The photo on the right shows before and after satellite photographs of the alleged bomb damage at Site 1. Since two or three bombs were allegedly dropped at this site (see photo at top of this page), the bomb damage should be evident as a large area of rubble where buildings were initially standing. A very careful review of these photographs indicates only a very small area that appears different at only one location. Such a small area could not be an area of damage from a single 500 pound bomb.



The small yellow circles show the location where the JIM investigation concludes that there was bomb damage from the attack on Site 1 that took place on April 4, 2017. Very careful measurements of the dimensions of this circle indicate it has a radius slightly smaller than 5 meters. The detonation of a 500 pound bomb would convert buildings within a circle of 15 to 20 meters to piles of rubble. Two or three 500 pound bombs dropped together, as indicated in the videos of the bomb debris cloud for this site would level a could easily level a row of buildings 100 meters in length.



The before and after satellite photographs on the right show a rough estimate of the area of buildings that would be reduced to rubble from an attack where to 2 to 3 500 pound bombs were dropped in a bombing run that produced the debris cloud shown in the photo at the top of this page. It is worthy of note that 44 days passed between February 21 and April 6, 2017. The JIM states that it obtained satellite photographs on April 3, 2017 which it used to determine that the crater where it claims there was a sarin release was produced on April 4. Those same satellite photos should be available to determine the before and after situations on the ground one day apart. One of the many mysteries associated with the JIM report is why these before and after satellite photographs were used when photographs were available, according to the JIM, only one day apart.



**Conclusion: There is no evidence of explosive bomb damage in any of the before and after satellite photographs cited by the JIM in its report to the UN Security Council**