

## **Project Framework:**

This report was prepared by Situ Studio within the framework of the Forensic Architecture Project.

Forensic Architecture seeks to provide and corroborate spatial evidence within the frames of international criminal law and human rights law. By helping to extend the means by which conflict can be mapped, modeled, and visualized, Forensic Architecture creates new grounds for thinking about IHL and human rights as they bear upon built structures, landscapes and urban environments. A multidisciplinary project-team based at the Centre for Research Architecture at Goldsmiths, University of London including the New York City based Situ Studio employs new technologies and novel forms of spatial analysis in order to query the function of space as evidence within the different forums of international justice. The project is engaged with mapping events within built up areas, conducting forensic analysis of building rubble, and modeling the effect on built structure. The project is organized by Eyal Weizman (director) of Goldsmiths, University of London and Paulo Tavares also of Goldsmiths.

Goldsmiths, University of London and Situ Studio have collaborated on a series of reports for the Forensic Architecture project including work undertaken for the prosecution team at the International Criminal Tribunal for the former Yugoslavia (ICTY) in the case of United Nations versus Vlastimir Djordjevic, former Serbian Chief of the Public Security Department, and in other research for B'Tselem in Israel and the West Bank.

## **Project Team:**

### **Center for Research Architecture:**

The Centre for Research Architecture (CRA), a multidisciplinary group of spatial practitioners directed by Eyal Weizman. CRA has gained an international reputation as a unique academic environment that combines theoretical inquiry with spatial practices. CRA become internationally recognized as a leading center for research-based practice within the fields of architecture especially in relation to questions concerning territorial conflicts, urbanism, human rights, politics, and mapping. CRA currently has about 20 practice/theory PhD candidates and a slightly smaller number of MA students. Amongst CRA's MA and PhD graduates and candidates are extremely innovative and world-renowned architects, artists and directors of architectural and art institutions and filmmakers. The core issues engaged at CRA are of spatial politics and human rights as they intersect with spatial and aesthetic practices. The Centre for Research Architecture has had a central place in extending the toolbox of architectural methodologies to include new modelling, mapping, and animation techniques, as well as the use of films and video documentation as modes of spatial representation.

### **Situ Studio:**

Based in Brooklyn, NY, Situ Studio was established in 2005 after its five partners graduated from the Cooper Union School of Architecture. Concentrating on digital design and visualization, the firm utilizes emerging technologies at the intersection of architecture and a variety of other disciplines to engage a wide range of projects. Recent work includes the digital reconstruction of ancient fossils for Professor Adam Maloof of Princeton University's Department of Geosciences as well as a series of analytical models for the Solomon R Guggenheim Museum, New York. In 2006, the firm received the Award for Excellence in Design, by the Art Commission of the City of New York. The partners teach at Pratt Institute, GSAPP, Columbia University and give workshops and lectures internationally.

## Project Principals:

### **Bradley Samuels,**

Partner, Situ Studio:

Bradley Samuels is a founding partner at Situ Studio. Samuels is a graduate of the Cooper Union School of Architecture and has taught at the Graduate School of Architecture, Planning and Preservation at Columbia University and been a guest critic at Harvard University's Graduate School of Design. Samuels' course at Columbia titled "Mapping Frontiers" explores emerging mapping, visualization and digital modeling tools in relation to their increasing role in the study of political borders, transnational infrastructures and questions of national sovereignty. Samuels has lectured extensively on the role of digital tools for both digital design as well as digital fabrication including, most recently, at the AIA Center for Architecture, The Museum of Modern Art and Columbia University.

### **Eyal Weizman,**

Director, Goldsmiths, University of London:

Eyal Weizman is an architect and director of the Centre for Research Architecture at Goldsmiths, University of London. He studied architecture at the Architectural Association in London and completed his PhD at the London Consortium/Birkbeck College. Since 2007 he is a member of the architectural collective "decolonizing architecture" in Beit Sahour/Palestine. [www.decolonizing.ps](http://www.decolonizing.ps) Since 2008 he is a member of B'Tselem board of directors. [www.btselem.org](http://www.btselem.org). Weizman has taught, lectured, curated and organised conferences in many institutions worldwide. His books include *The Lesser Evil* [Nottetempo, 2009], *Hollow Land* [Verso Books, 2007], *A Civilian Occupation* [Verso Books, 2003], the series *Territories 1,2 and 3*, *Yellow Rhythms* and many articles in journals, magazines and edited books. Weizman is a regular contributor and an editorial board member for several journals and magazines including *Humanity*, *Cabinet* and *Inflexions*. Weizman is the recipient of the James Stirling Memorial Lecture Prize for 2006-2007 and was chosen to deliver the Edward Said Memorial Lecture at Warwick 2010.

## **Methodological Summary:**

This analysis and subsequent report was generated from a number of documents provided by B'tselem. These documents include high resolution aerial photographs, topographic maps, and photographic and video footage of the site, including those taken on the day that Bassem abu Rahma was killed. Working from these documents, a digital model of the landscape was constructed and the positions of Mr. Abu Rahma and the videographers established. All positions of IDF soldiers discernable in the video footage were also established in the digital model. The location and structure of the fence and gate elements were also digitally rebuilt from the above documents and included in the virtual model. This digital model of the environment, and the positions of the relevant persons within it, provided the basis for the analysis that followed. Questions regarding landscape features or site conditions not discernable from the video footage, maps or aerial photographs were directed to Btselem staff for clarification and on-site inspection. Site conditions were verified with Btselem staff in this manner as necessary throughout the analysis

The primary documentation collected on the day of the event combined with the digital model of the site was sufficiently robust to allow a series of possible scenarios to be tested. After modeling the landscape and establishing positions for all relevant parties, a series of (ballistic) equations were run utilizing specifications for the model 4431 CS munition provided by Combined Systems Inc. The equations were run iteratively through a visualization software to reconstruct the path of the munition through a series of possible launch angles. These angles were then mapped onto the landscape and shown relative to the positions of IDF soldiers, the fence(s) and Mr. Abu Rahma. The conclusions outlined in the report were drawn from the analysis conducted on these reconstructions.

## Assumptions

### 1. Projectile component weight

The manufacturer's (Combined Systems Inc.) specifications for this munition only include its "total weight." The calculations conducted in ballistic analysis required only the weight of the projectile component of the round that travels after being fired. B'tselem staff weighed an identical round gathered from the field and provided the 130gram weight used in the calculations.

### 2. Topography

The landscape for the digital model was based on publicly available Digital Elevation Models (DEM) that provided sufficient resolution for modeling relative positions of Bassem, the fence, and IDF soldiers given the scope of inquiry. Additional landscape detail beyond the resolution of the DEM was modeled from features visible in the video footage and utilized in figures G,H,I and J of the report.

### 3. Soldier Positions

Six potential positions of soldiers firing long range CS canisters were established based on the available video footage shot that day. An assumption was made that the lethal canister was shot from a range consistent with these positions.

### 4. Open Fire Regulations

A 60 degree angle was identified as the minimum allowable angle of discharge for this weapon per the Open Fire Regulations outlined in B'tselem Executive Director Jessica Montell's April 21, 2009 letter addressed to Military Advocate-General Avichai Mandelblit. The 60 degree angle became a benchmark figure in the report. Visualization models were run to understand behavior of this munition when discharged at this angle.

### 5. Air and Wind

Air density was assumed to be 1.204 kg/m<sup>3</sup>. Given the focus of the inquiry, the effect of wind was presumed to be negligible and therefore excluded from calculations.