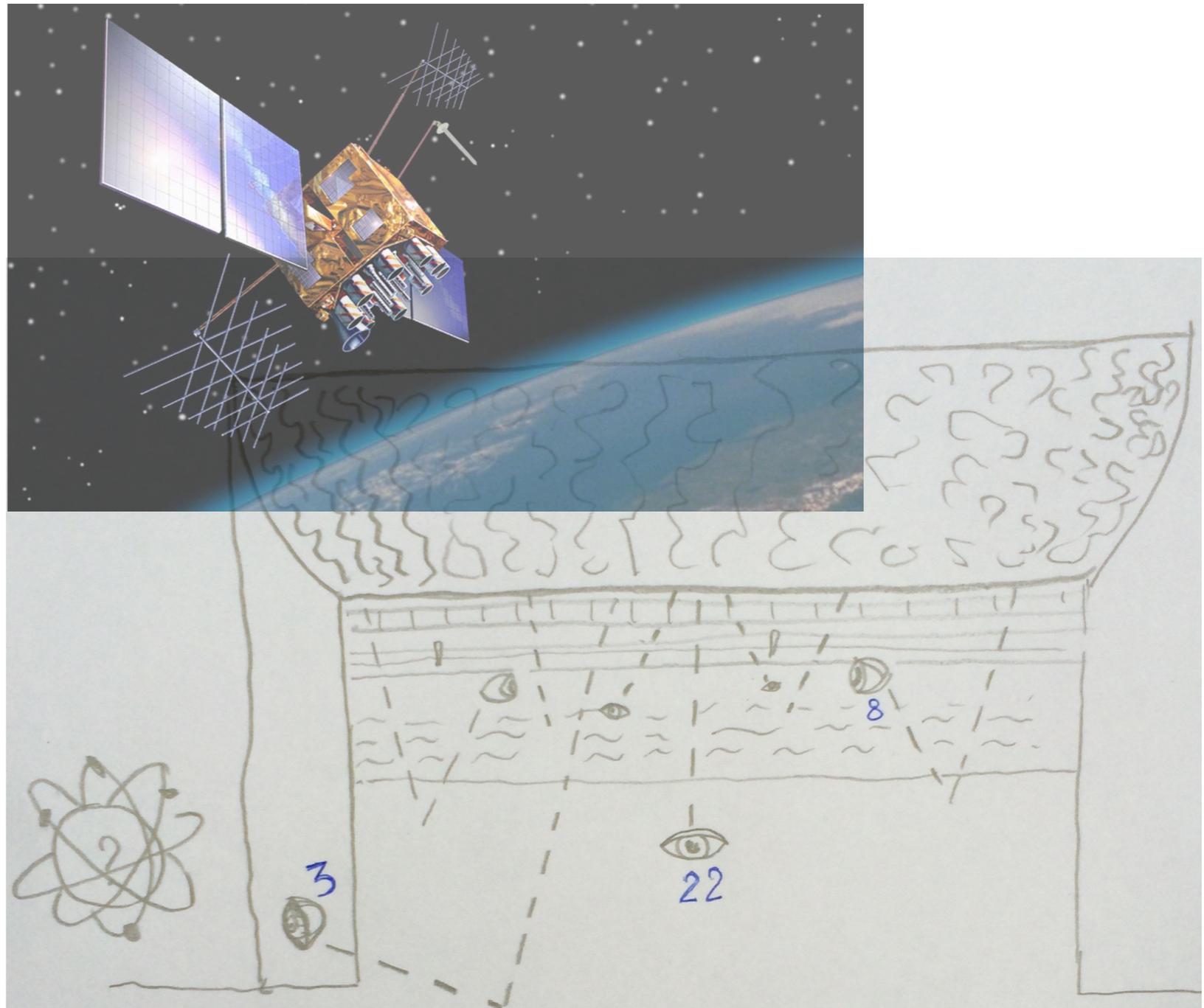
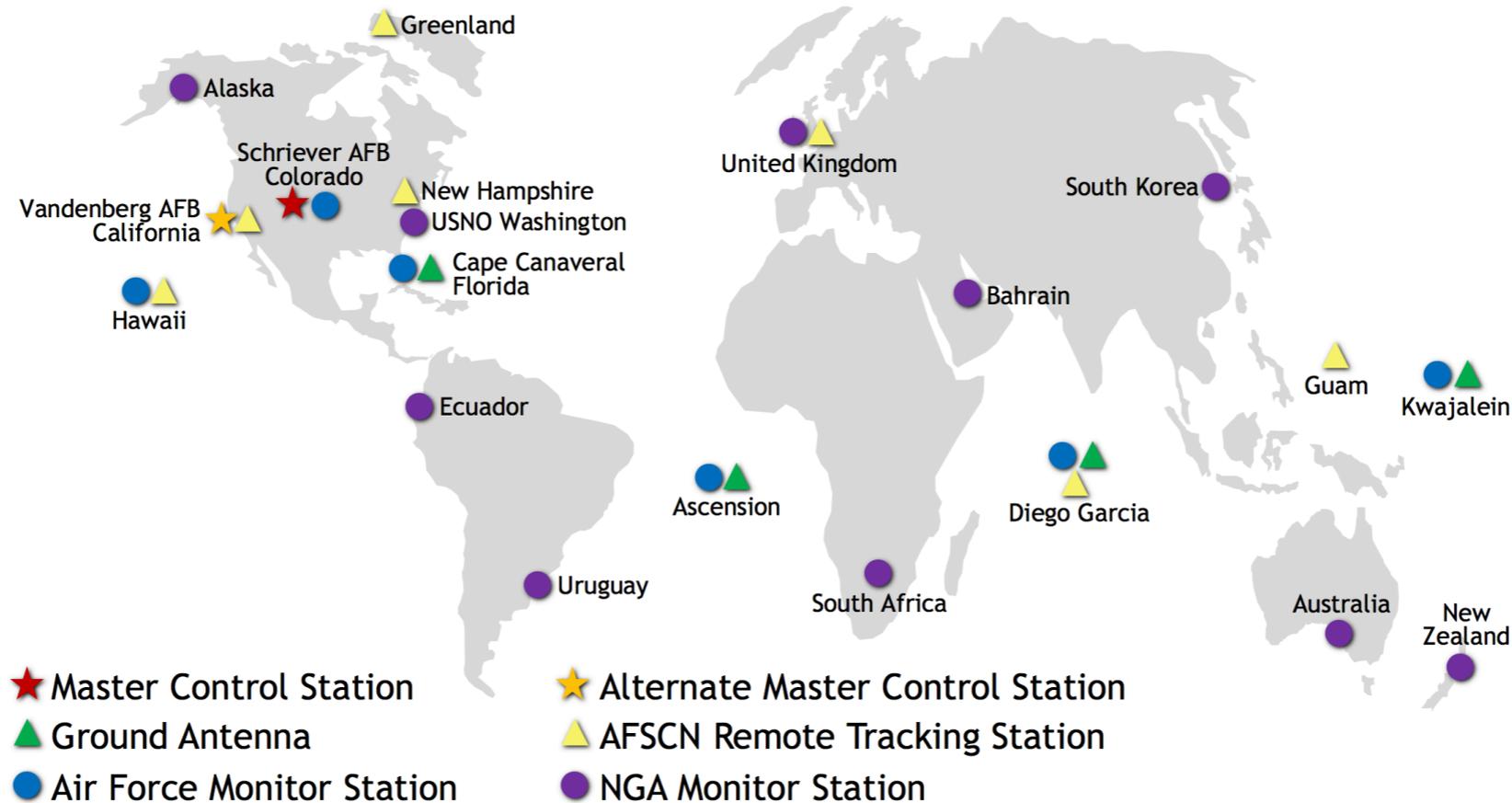


A Trail of Breadcrumbs: The interplay of GPS sensors, infrastructures, tracking and sociotechnical practices



Christopher Wood

GPS Control Segment



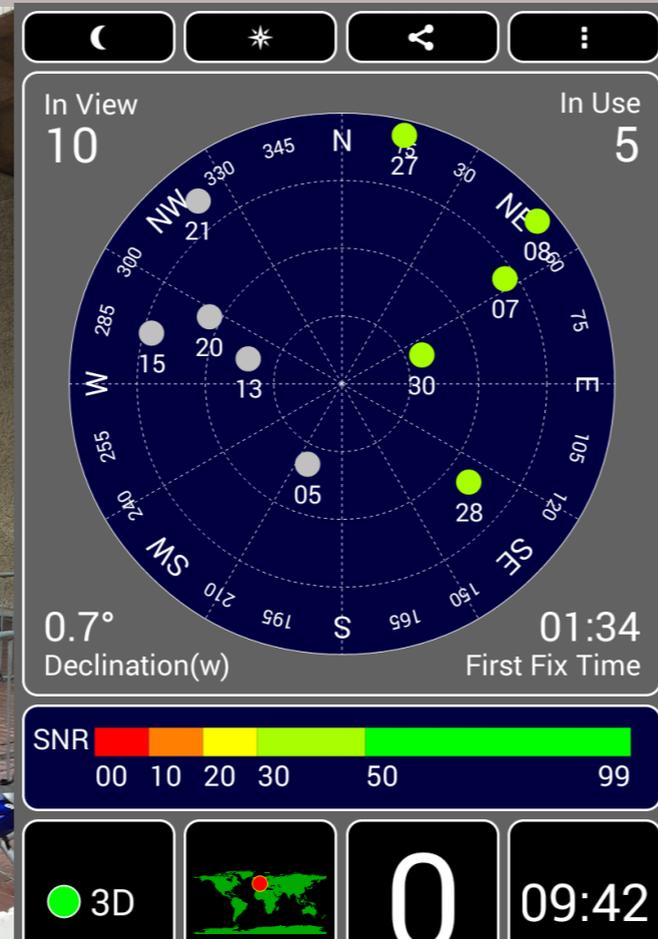
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Currently, the GPS network comprises a constellation of 31 satellites, positioned in six orbital planes. The GPS network also comprises a series of ground stations which are responsible for updating an almanac of satellite positions (used by devices to cross reference satellites and establish location) and make small adjustments to satellite orbits or on-board atomic clocks. The whole system is maintained by the US air force and found much of its early use in military operations. The ground portion of the GPS infrastructure is dotted around the world at US military complexes in the UK; Diego Garcia (Indian Ocean); Guam (Pacific Ocean). I mention these details to emphasise that a system which may appear to be odourless and value neutral when represented by a blue dot on an iPhone map, is in fact a highly complex infrastructure developed and maintained by a military organisation. In this way, GPS is deeply implicated in US military power and the politics of the deployment of that power around the world.

Curious how peoples' understanding of the way they use GPS might shift once they were more aware of this infrastructure, I led a series of workshops designed to draw attention to the infrastructure's presence.

The workshops, part of my PhD research at Queen Mary University of London, were open to the general public and took place in spring and summer 2016 at the Barbican Estate and Arts Centre in central London. They were not a formal collaboration with the Barbican, but rather as part of collaborations with research organisations The Culture Capital Exchange and Antiuniversity Now.

Over the course of the three workshops I worked with 19 participants, the majority of whom identified as artists or researchers. They were a mixture of students and professionals, largely recruited through the collaborator organisations.



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3D



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The workshop created what has been called an “infrastructural inversion” (Bowker and Star 1999). It did this by leveraging moments of breakdown to make infrastructure more “visible” (Star and Ruhleder 1996).



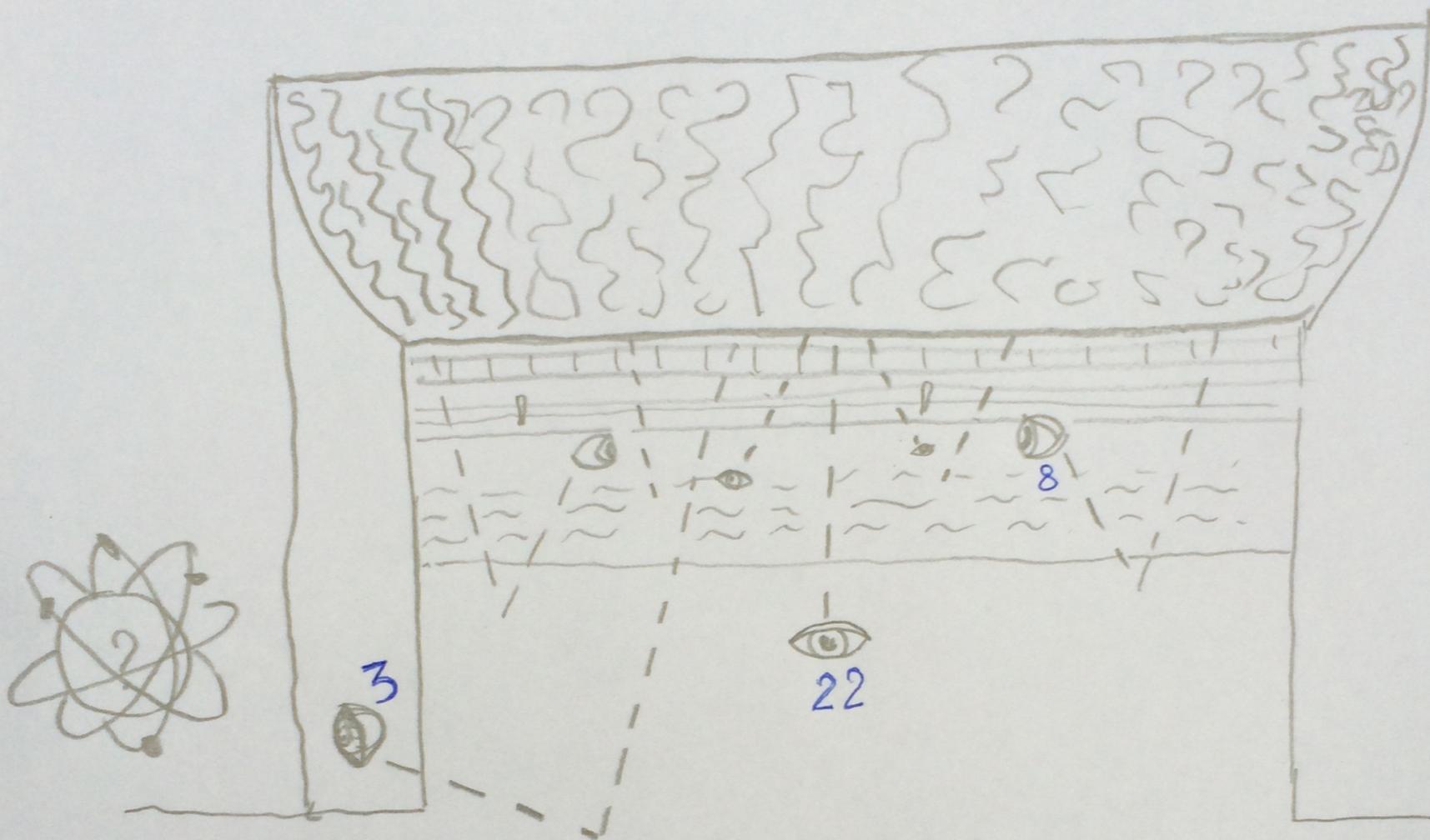
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The Barbican was chosen because of the disruptive effect its architecture has on GPS reception.

This acts as a form of infrastructural inversion, making the materiality of GPS signals more visible. They used an app called GPS Test which visualises the position and signal strength of overhead GPS satellites. After the walk, participants were asked to reflect on the experience via individual creative writing and drawing followed by a group discussion.



7



“Clocking 11 and sometimes 12 satellites made me feel watched”

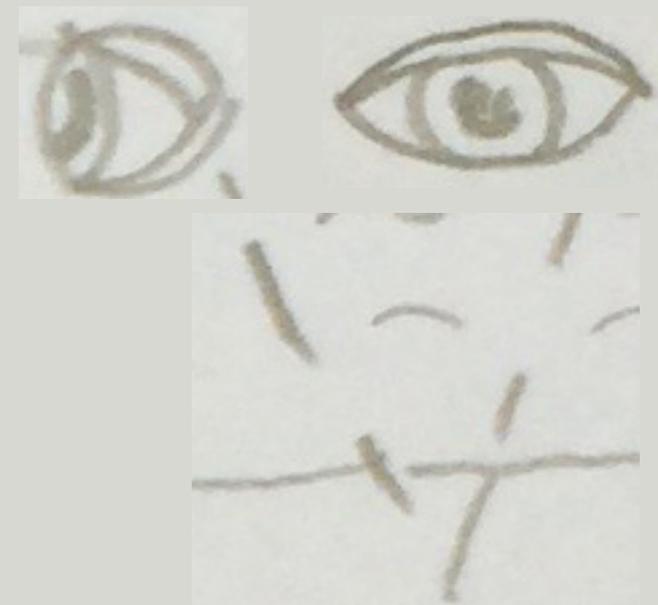
In fact, the “watching” takes place further up the data chain in the form of location tracking, the satellites never receive location information. Nevertheless, they acted as a focal point for concerns around surveillance. While this interpretation of the system is certainly naïve, as a metaphor it is of great interest.

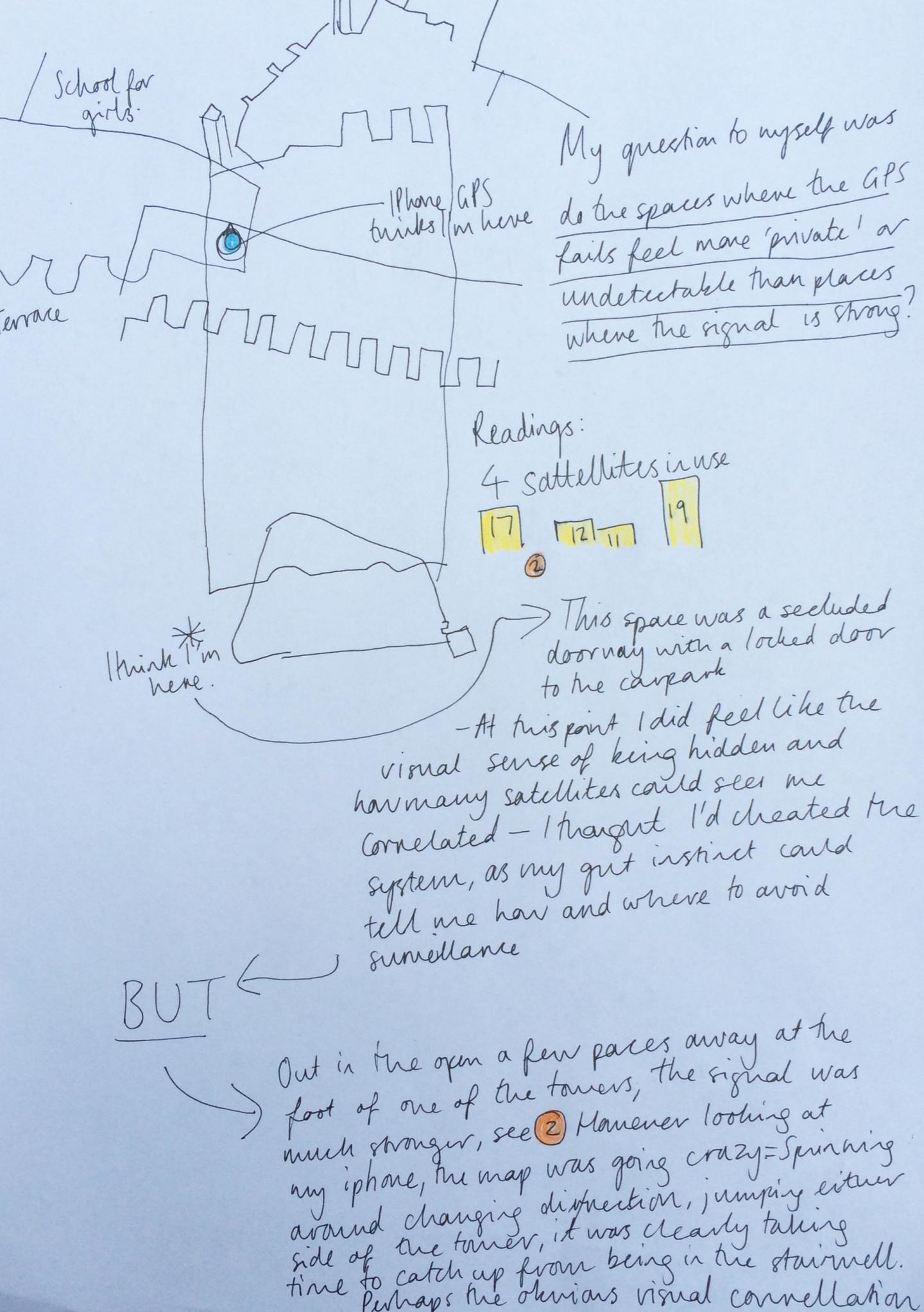
8

Texture is understood as how an infrastructure can be felt to act. Texture is, according to Bowker and Star (1999), often well described using metaphor. Indeed, in cases where the action of an infrastructure is indirect, metaphor can be a powerful and useful way of understanding and communicating that action.

(these) Satellites don't have eyes. When we understand an infrastructure as more active, there is often some anthropomorphism. Here, being watched can be understood as metaphor for the sociotechnical structure at large, including those portions upstream from the GPS sensor.

anthropomorphisation





“I had this slight paranoia that I couldn't escape and in fact I do keep my location switched off most of the time because I don't like the idea of satellites knowing where I am, but in an abstract way, but this brings it home to me that they really do know where I am and they're really up there”.

A privacy calculus refers to a process of logical consideration wherein the user decides that the benefits offered by location services are worth giving up a certain level of privacy for (Xu and Gupta 2009; Xu et. al. 2010). From the data collected here I would argue that the privacy calculus, understood this way, may be misleading. While people may be abstractly aware they are giving up their privacy, the nature of that exchange is generally concealed either in lengthy terms and conditions documents or, in this case, via a blackboxed infrastructure. When the participants said the experiment “brought it home that... they're really up there”, the privacy calculus shifted and, through a reminder of the presence of the infrastructure at large, they began to become more aware of what was lost rather than gained.

My intentions were exploratory; to peek at the infrastructure that was being hidden. This exploration need not be an end unto itself. Tools such as this workshop can work within a broader methodological toolbox. Affective staging was powerful in the workshop, creating participant reflection about infrastructure and so, in turn, exposing considerable situational concerns about privacy in relation to GPS. Colleagues may find this exploratory aspect useful as starting point, may wish to use methods like this one to create new starting points in their areas of research, or use careful, affect-driven staging borrowed from artistic practice to catalyse participant reflection or increase participant engagement (Thrift 2007) in the research process.



Images

- 1) Composite. Participant drawing and artist's impression of GPS-IIM satellite. Satellite drawing available at https://en.wikipedia.org/wiki/GPS_satellite_blocks#/media/File:GPS-IIRM.jpg [accessed 3rd May 2019]. Public Domain
- 2) Control Segment of the GPS system. Available at <https://www.gps.gov/systems/gps/control/> [accessed 3rd May 2019]. Public Domain.
- 3) The Barbican Estate. Author's photo.
- 4) Screenshot from GPS Test app developed by Chartcross.
- 5) The Barbican Estate. Author's photo.
- 6) Artist's impression of GPS-IIM satellite. available at https://en.wikipedia.org/wiki/GPS_satellite_blocks#/media/File:GPS-IIRM.jpg [accessed 3rd May 2019]. Public Domain.
- 7) Writing workshop. Author's photo.
- 8) Participant drawing. Author's photo.
- 9) Participant drawing. Author's photo.
- 10) Participant drawing. Author's photo.

all participant drawings and quotes used with permission

References

- Bowker, G. and Star, S. L. (1999). *Sorting Things Out: Classification and its consequences*. Cambridge, MA: MIT Press.
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