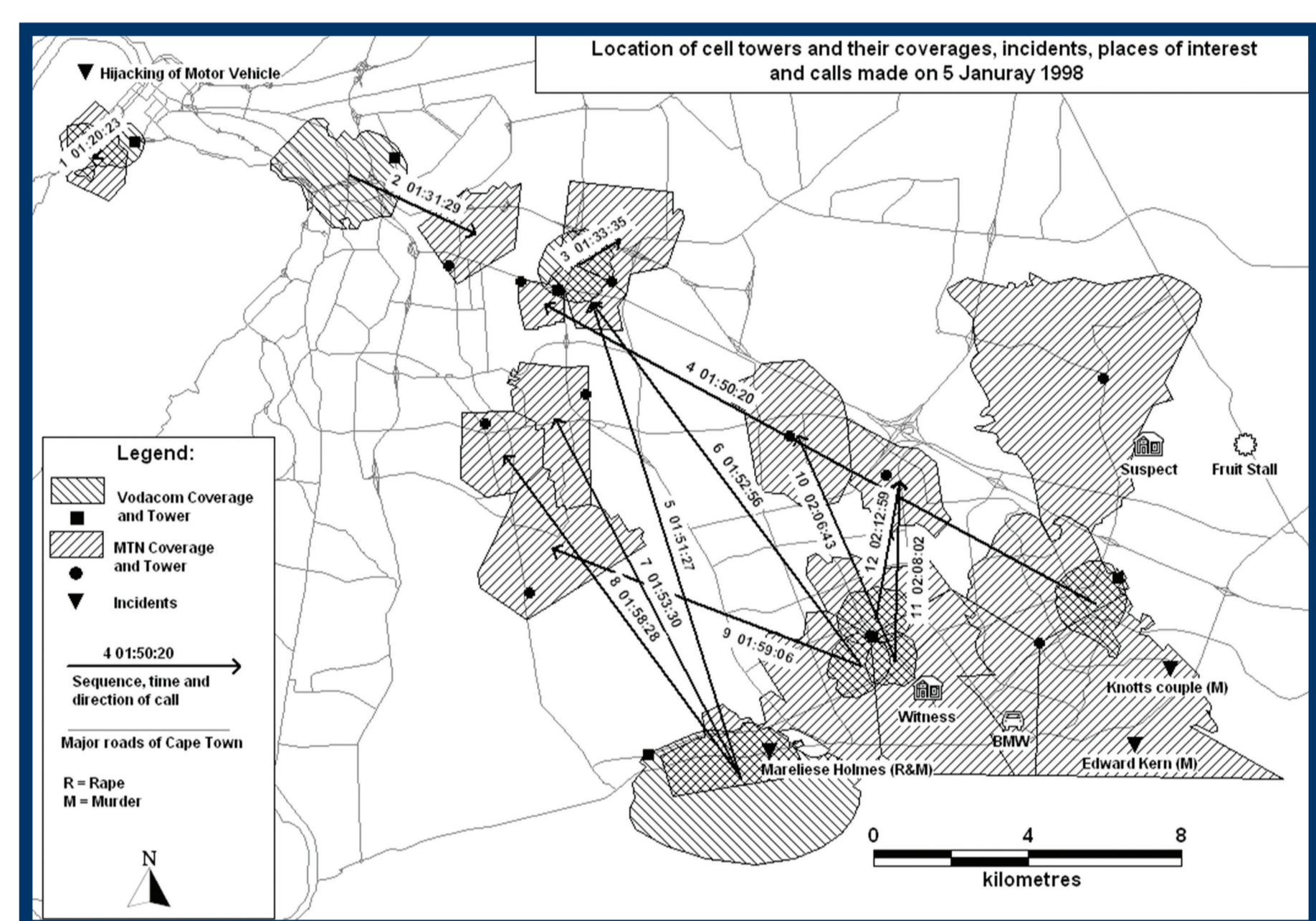


Using GIS as a forensic tool: 10 years of CSIR involvement

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The CSIR started with crime mapping research in 1997 as part of an Innovation Fund project. The aim was then to demonstrate to the South African Police Service (SAPS) the advantage of using geographic information systems (GIS) and crime mapping to guide police activities. A spin-off from this project was the use of GIS as a forensic tool to enable the police and courts to understand complex cases. All the forensic cases that were done involved cellular telephone data. The first involvement was in 1999 when the CSIR was involved in an Innovation Fund project looking at various methodologies of combating crime including the use of GIS.

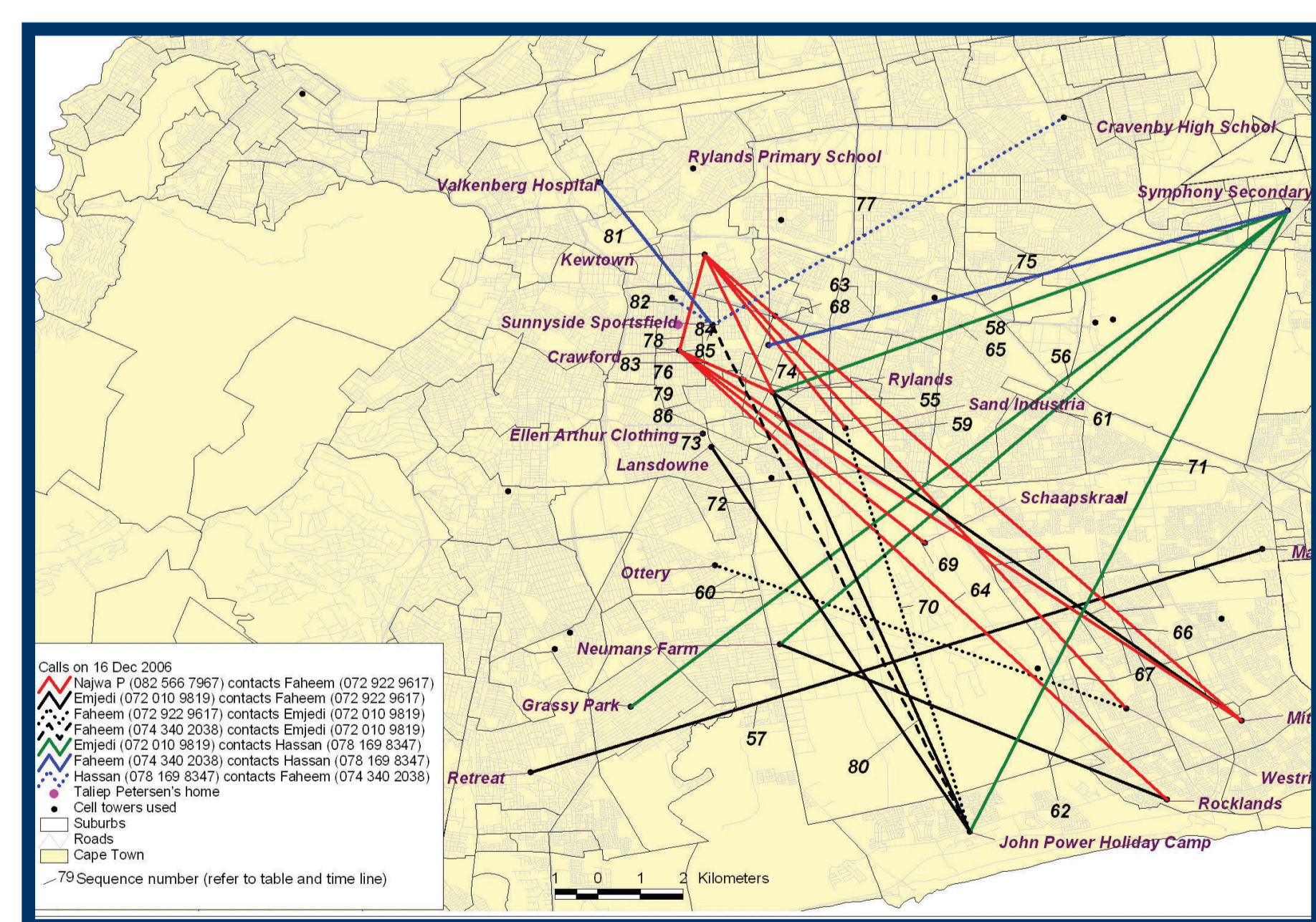
The CSIR was requested by the SAPS and the National Prosecuting Authority (NPA) in 1999 to map cell phone conversations between criminals suspected in kidnapping, hijacking a motor vehicle, murder and rape of a couple in Cape Town.



Cell map 1999

This was the first application of forensic GIS done by the CSIR in 1999. The case was about the notorious New Year's gang in Cape Town that went on a hijacking and killing spree early January 1998. This map was used to indicate the communication between the suspects and their relation to points of interest and crime scenes such as the locations of murders, rape and the witness. The map was presented in court and used by the prosecutor to cross-examine the accused. The accused were found guilty based on the information displayed on the map plus other evidence brought to the court by the prosecutor. The accused received life sentences without an option of parole.

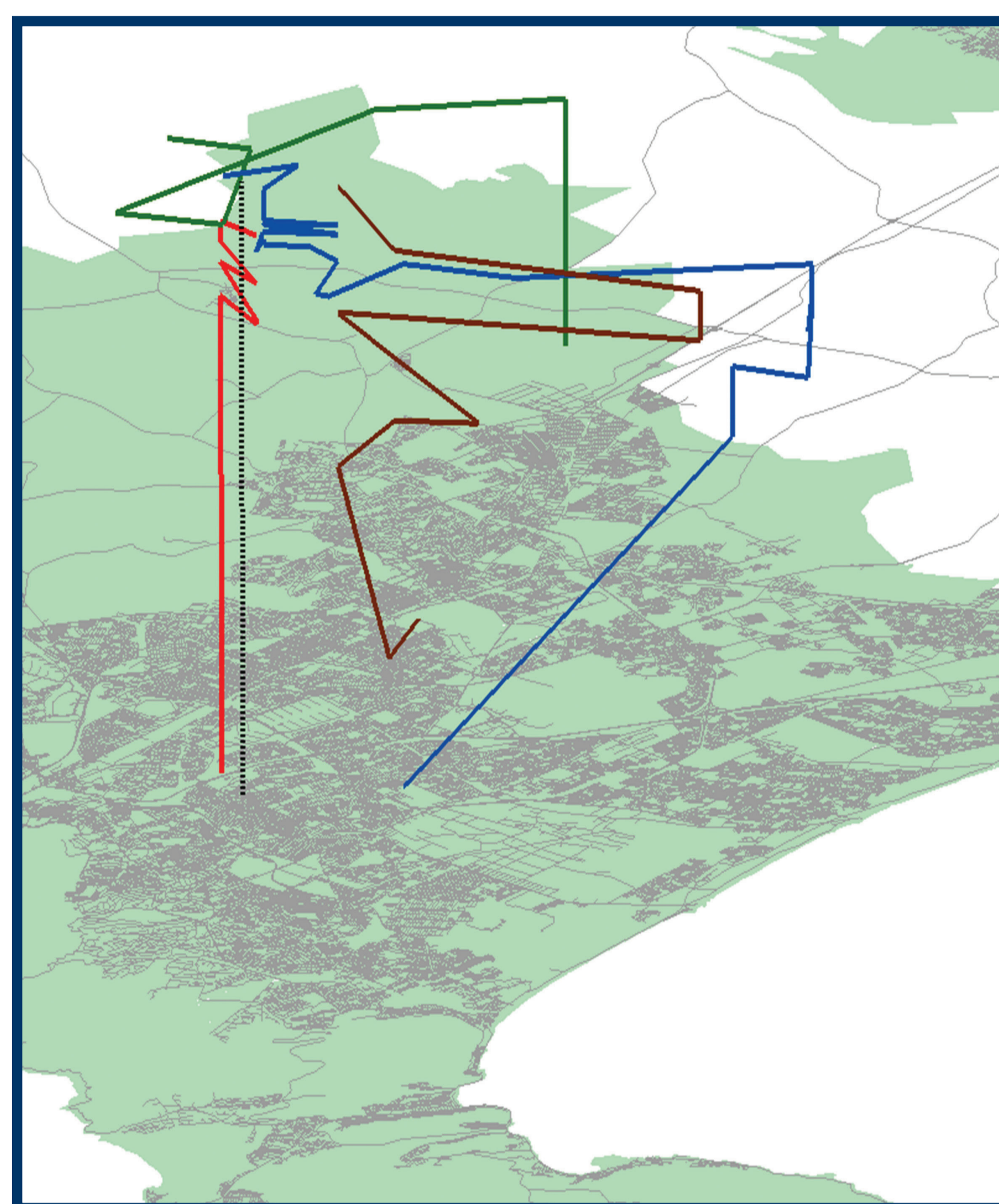
The resultant map was then used as evidence in court. Subsequent involvement in cases resulted after the successful conviction of the criminals. The CSIRs involvement ranged from mapping cell phone conversations that were used during the committing of murders, hijacking of freight and kidnapping for ransom, the use of satellite imagery to map a land invasion, the use of maps in serial murder cases, to the use of a space-time graph in the Taliq Petersen murder case in 2008. The poster will also demonstrate the use of geographic profiling to establish possible anchor points for serial criminals as well as further research done on cell phone data.



16 December 2006

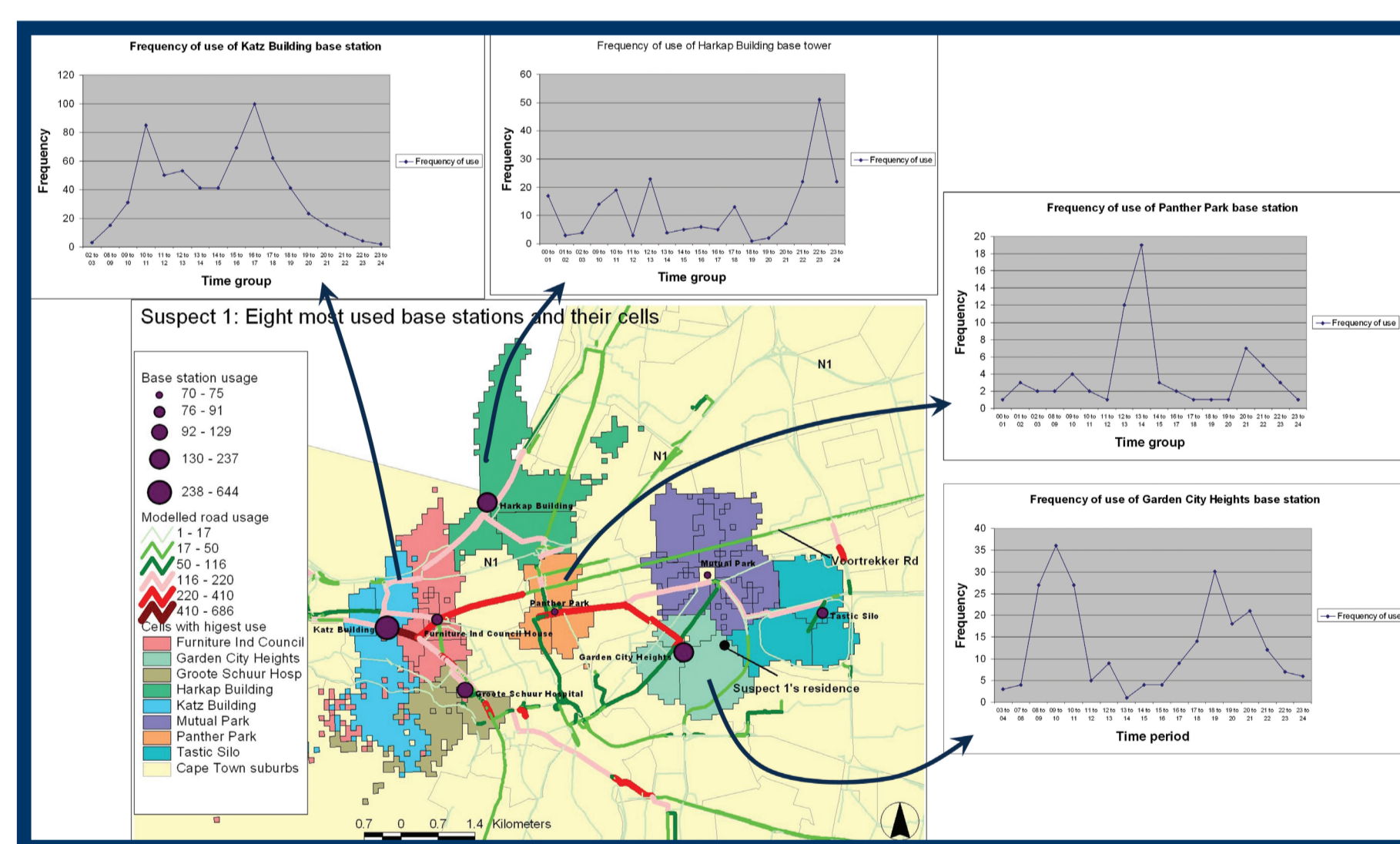
The next two maps are maps used in the Taliq Petersen murder case. The first map above shows the communication between the suspects on 16 December 2006, the night when Petersen was murdered. The numbers (e.g. 61, 57 and 80) are linked to a table containing the call data records that were used to give the time of day of the call. The location of the cell towers were used as a geographic reference. The second map (top right) is a space-time graph of the same calls as shown in the map above. These lines now show the movement of two of the suspects towards the home of Petersen and after the murder, away from the house.

The alleged mastermind and second-in-command did not go to the house that night but moved around in the vicinity to monitor the situation. The case is still in court.

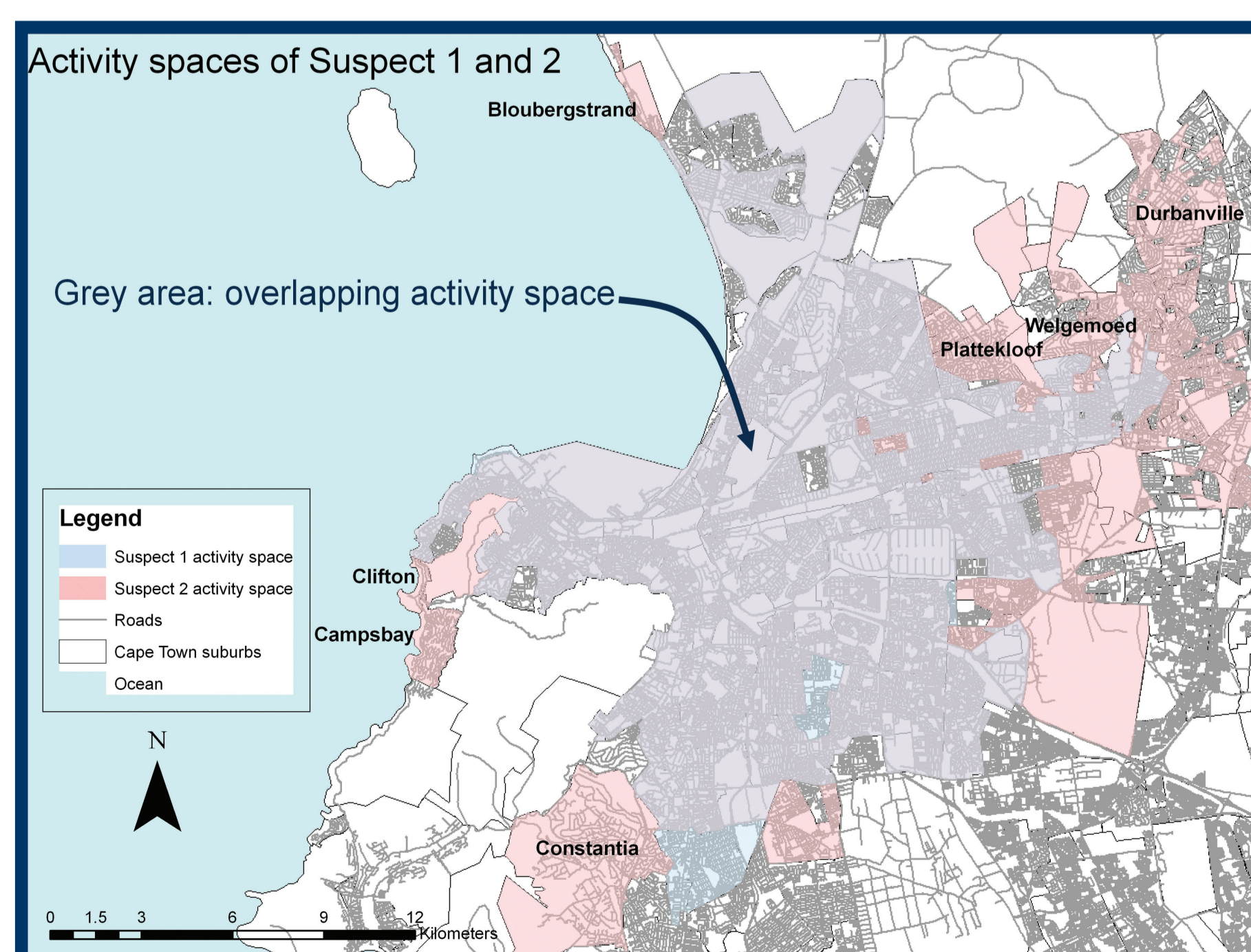


16 December 2006 3D map

The last example is the use of cellular telephone data to establish the possible roads and anchor points used by a suspect (the geographic profile). It also indicates the frequency and time of day use of specific cell towers by the suspect. This information can be used by the police officers to determine surveillance operations in order to apprehend the suspect. The second map in this example shows the activity space of the two suspects. The first suspect is from the Cape Flats and does not feel comfortable to move in up-market areas of Cape Town, whereas the second suspect is from the Cape Town upper class and is thus comfortable to move around the up-market areas.



Anchor points



Activity space



CSIR research uses geographic information systems (GIS), crime mapping and cell phone data to guide policing activities and to provide the authorities with forensic evidence in criminal cases.