Laboratory Support of the Influenza A H1N1(2009)

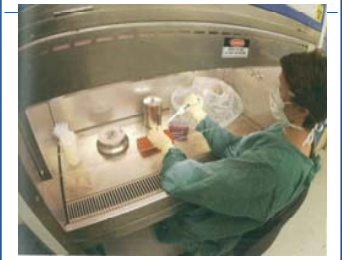
Public Health Response in Victoria

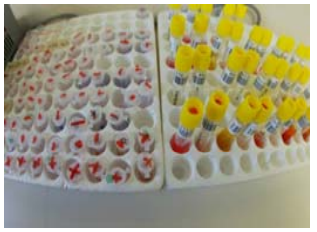
Dr. Mike Catton

VIDRL
Victorian Infectious Diseases Reference Laboratory

Role of the Public Health Laboratory

in Infectious Diseases Outbreaks

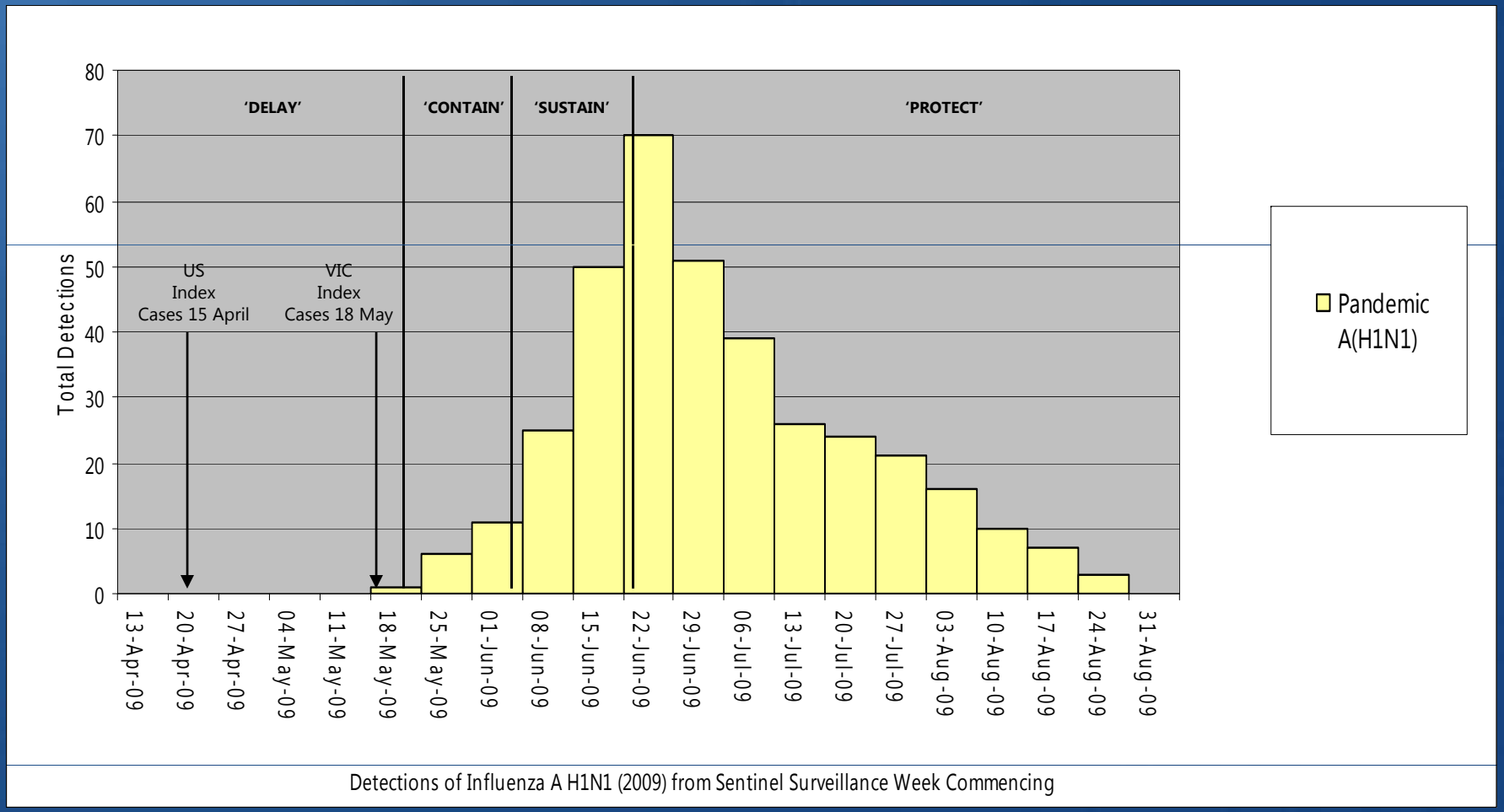




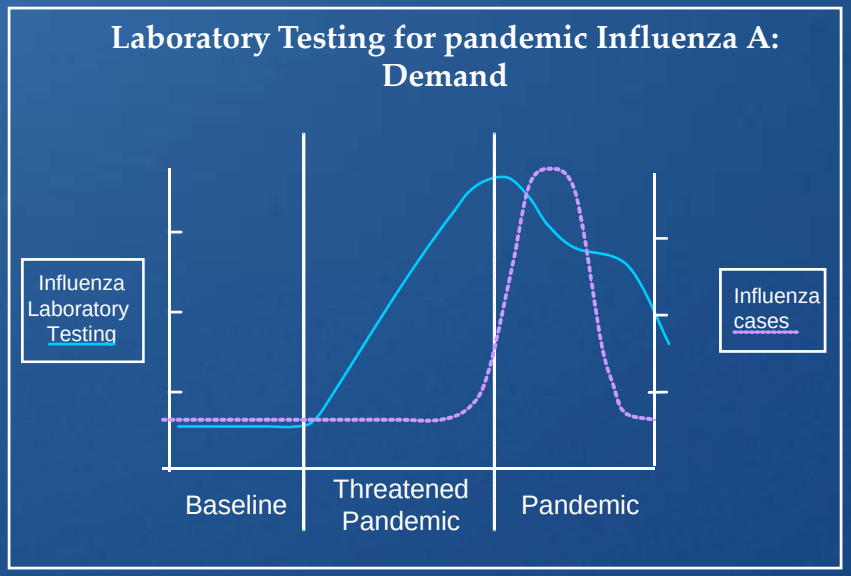
- Develop and maintain appropriate laboratory capacity
- Surveillance and initial case finding.
- Diagnostic and reference testing supporting Public Health investigation.
- Timely notification of cases to Public Health Authorities
- Contribute to Public Health management decisions
- Research

Influenza A H1N1 (2009) in Victoria:

Phases of the Public Health Response

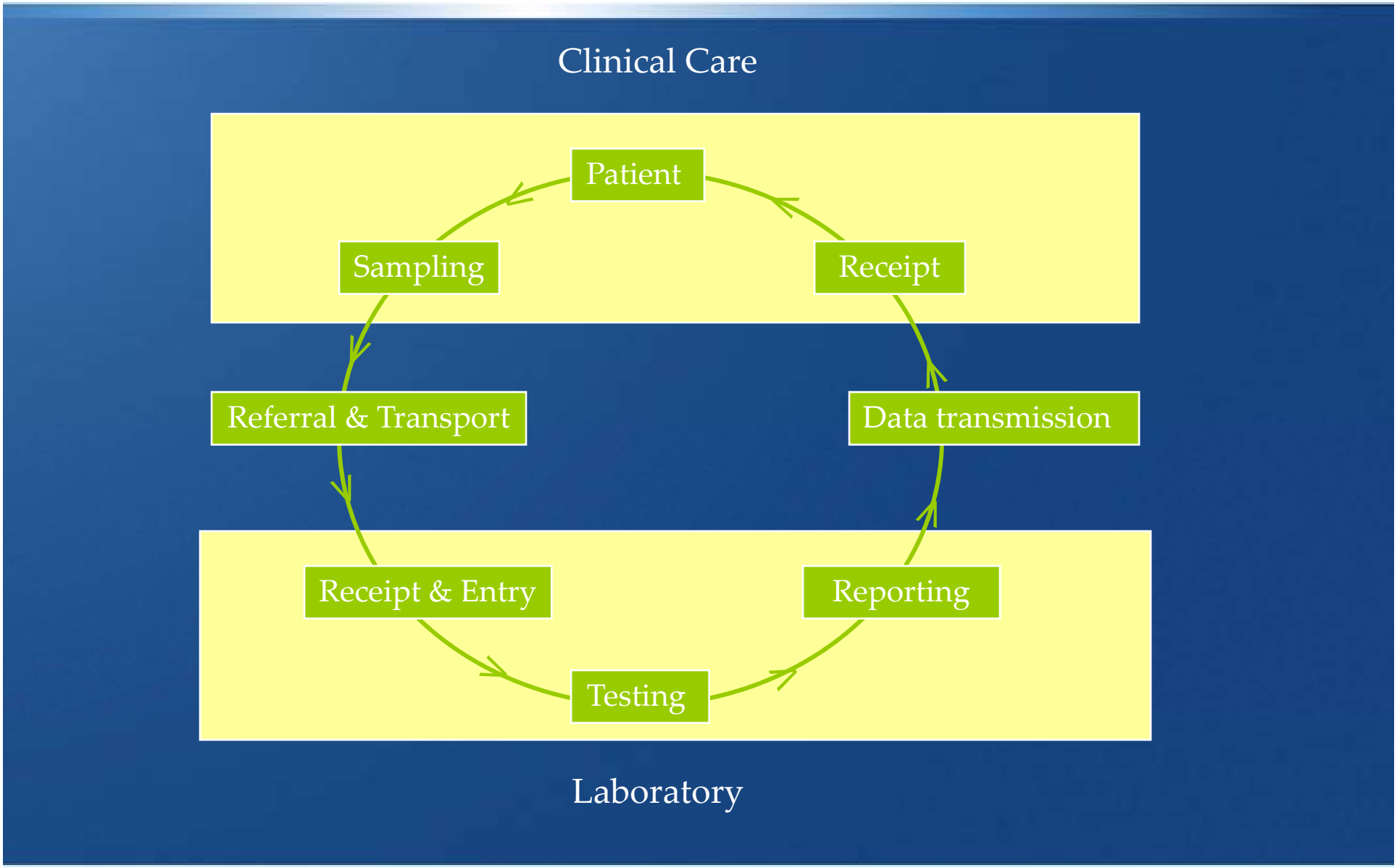


Pandemic Preparedness: VIDRL



- **Throughput capacity**
  - Planned surge capacity of 500+ extra PCR/day
  - Planned duration 2 + weeks then step down to clinical testing
- **Facilities/Equipment**
  - Dedicated outbreak facility
  - Nucleic acid extraction robotics + real time PCR analysers
- **Staffing**
  - 2 dedicated 'surge' EFT scientists
  - Secretaries cross trained on LIMS key entry
  - Additional support from 'quiet' laboratory areas
- **Reagents**
  - Stockpile of non-perishable reagents.

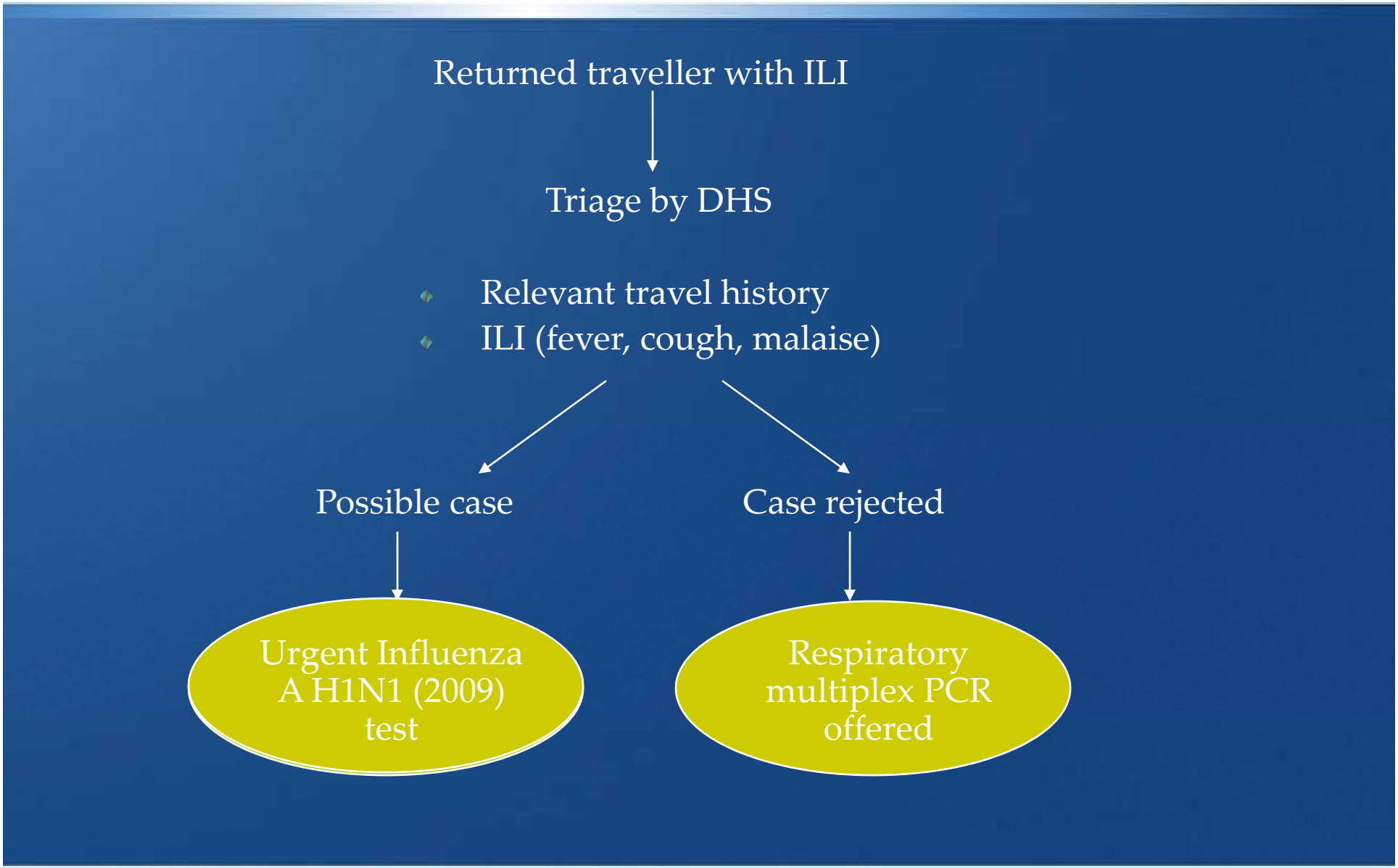
The Testing Cycle



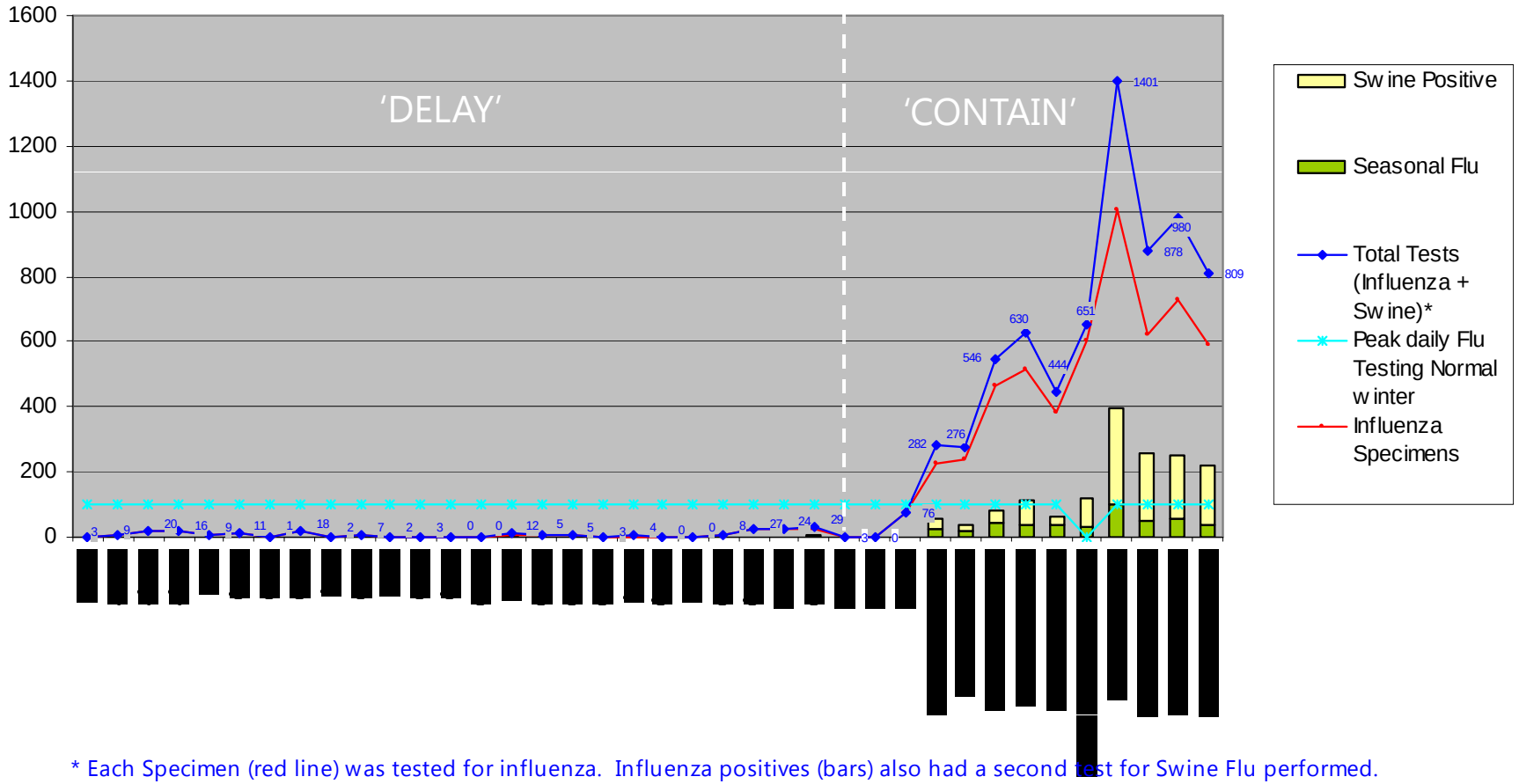
Laboratory Detection of Pandemic Influenza A

- Pooled nose and throat swabs
- Real-time PCR based detection
- Dual PCR primer sets
  - Matrix gene – detection of all 16 influenza subtypes
  - Haemagglutinin gene – differentiation of subtypes
- Referral to WHOCC for characterisation
- Prompted by 2 x US index cases 15 April:
  - Matrix & H1 PCR primers checked against H1N1 (2009) sequence
  - Specific H1N1 (2009) probe design

'DELAY' Phase
Influenza A H1N1 (2009) testing protocol: Victoria

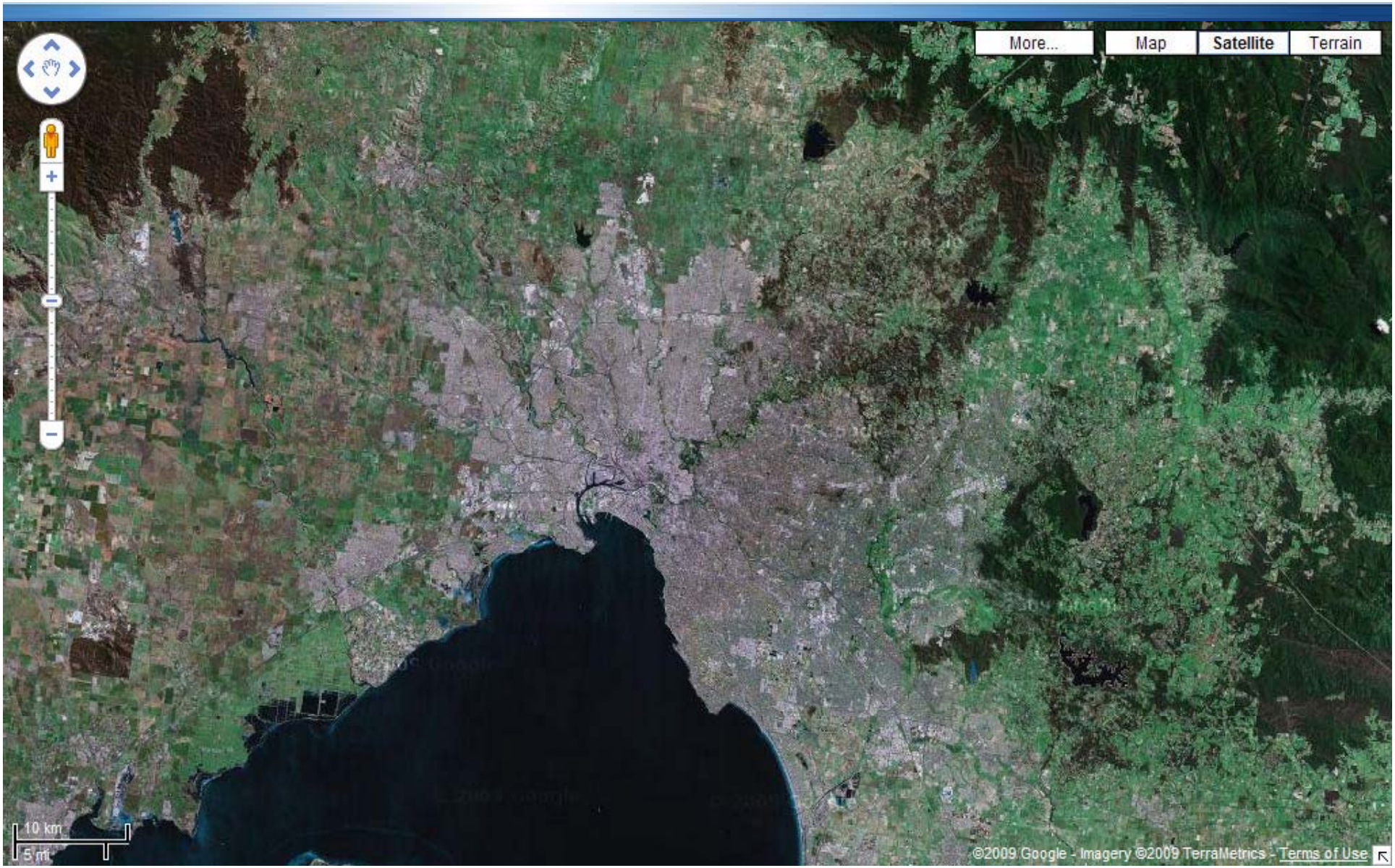


Surge Capacity: Influenza A H1N1 (2009) PCR Throughput Viral Identification (VI) Laboratory VIDRL – 'CONTAIN' Phase

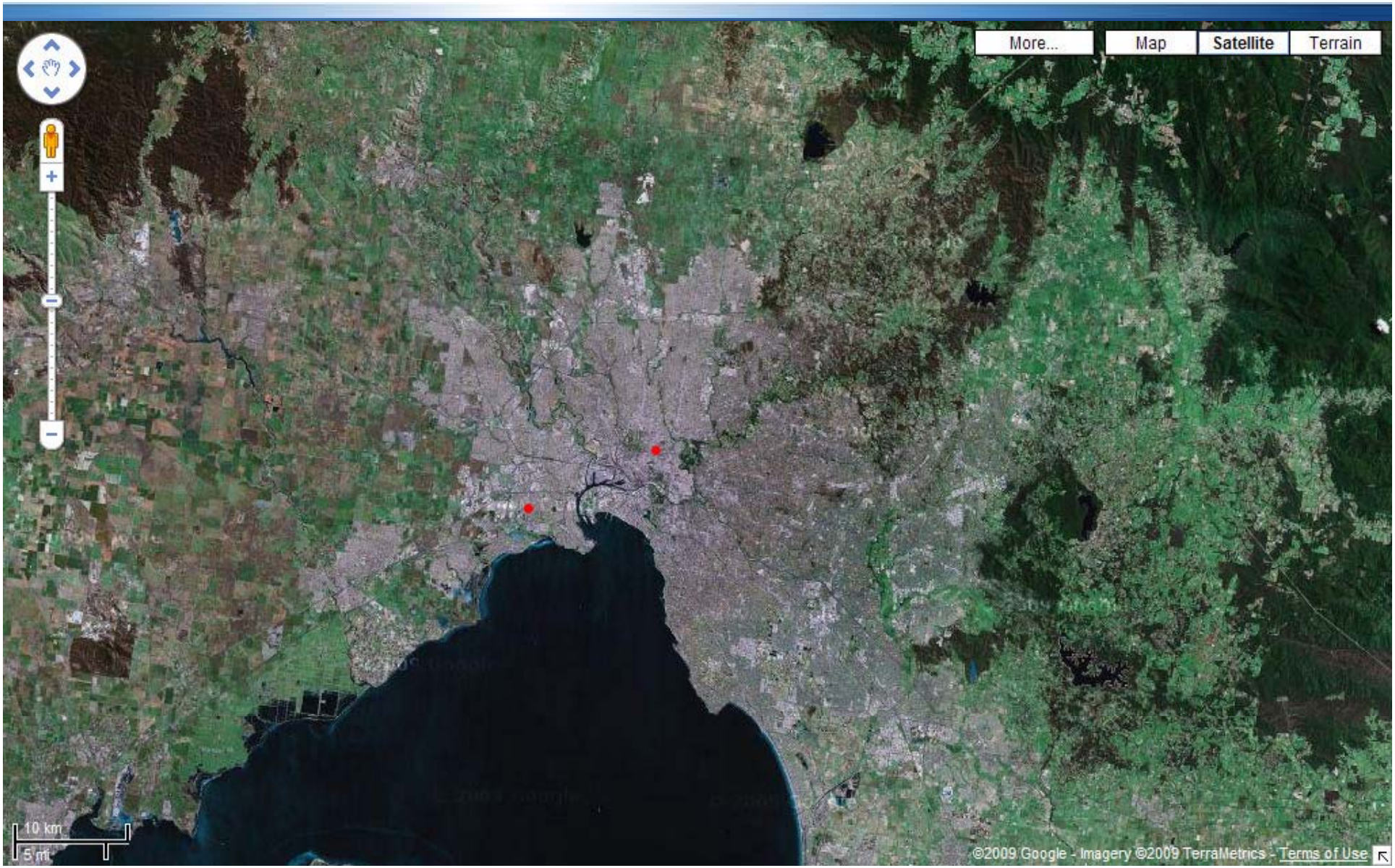


* Each Specimen (red line) was tested for influenza. Influenza positives (bars) also had a second test for Swine Flu performed. Total tests (blue line) records numbers of both sets of tets.

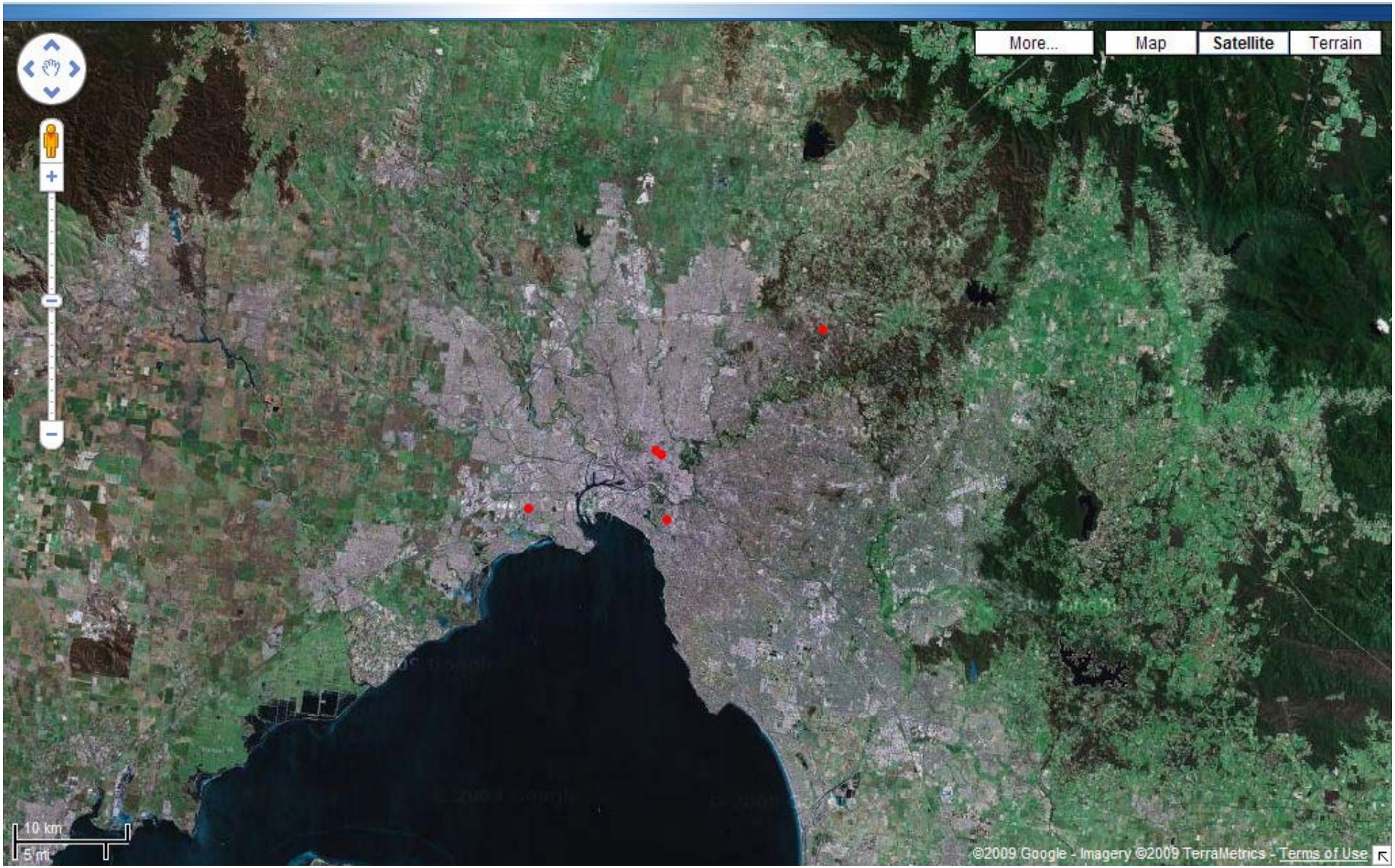
May 17 Day=0


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

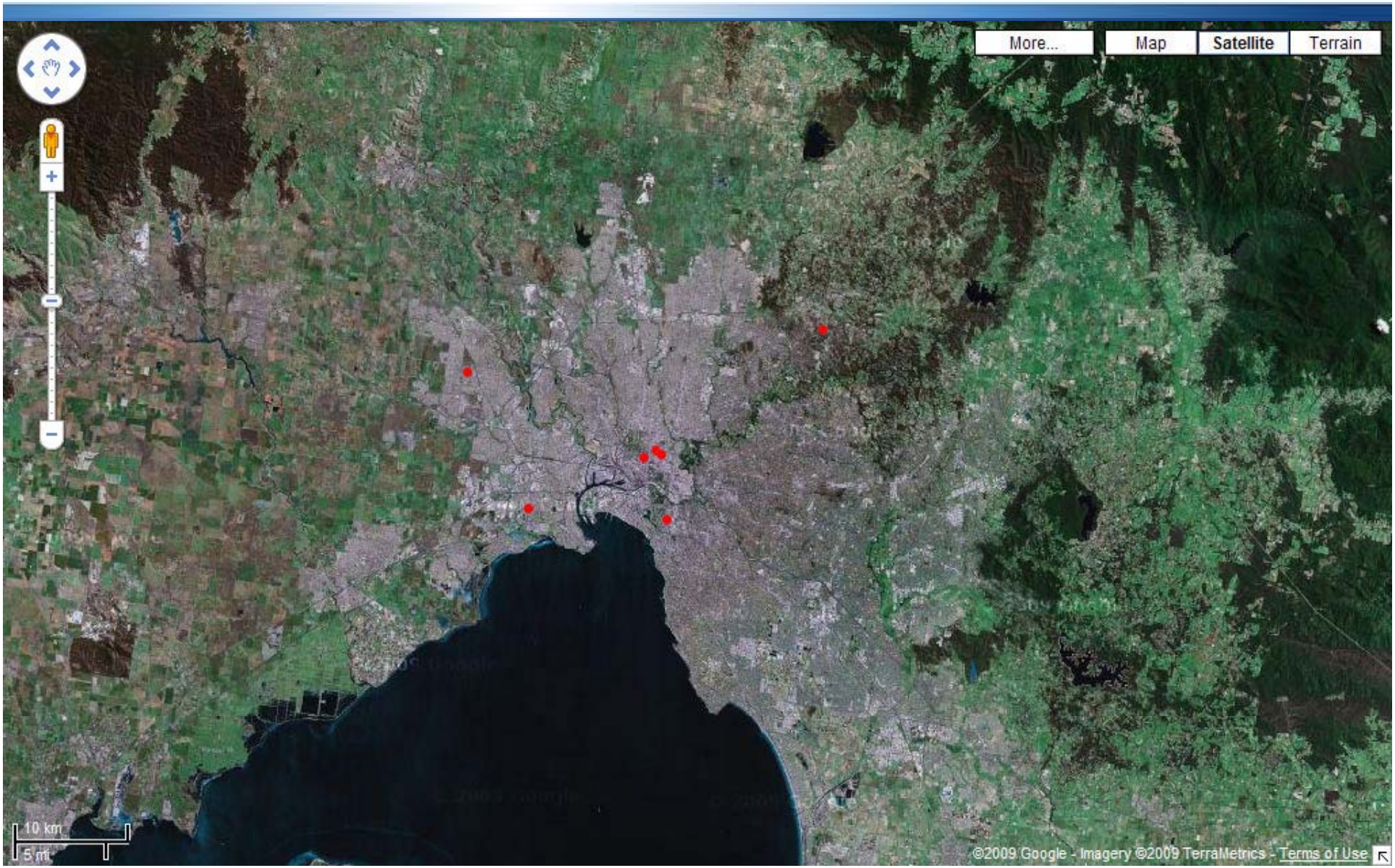
May 18 Day=1


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

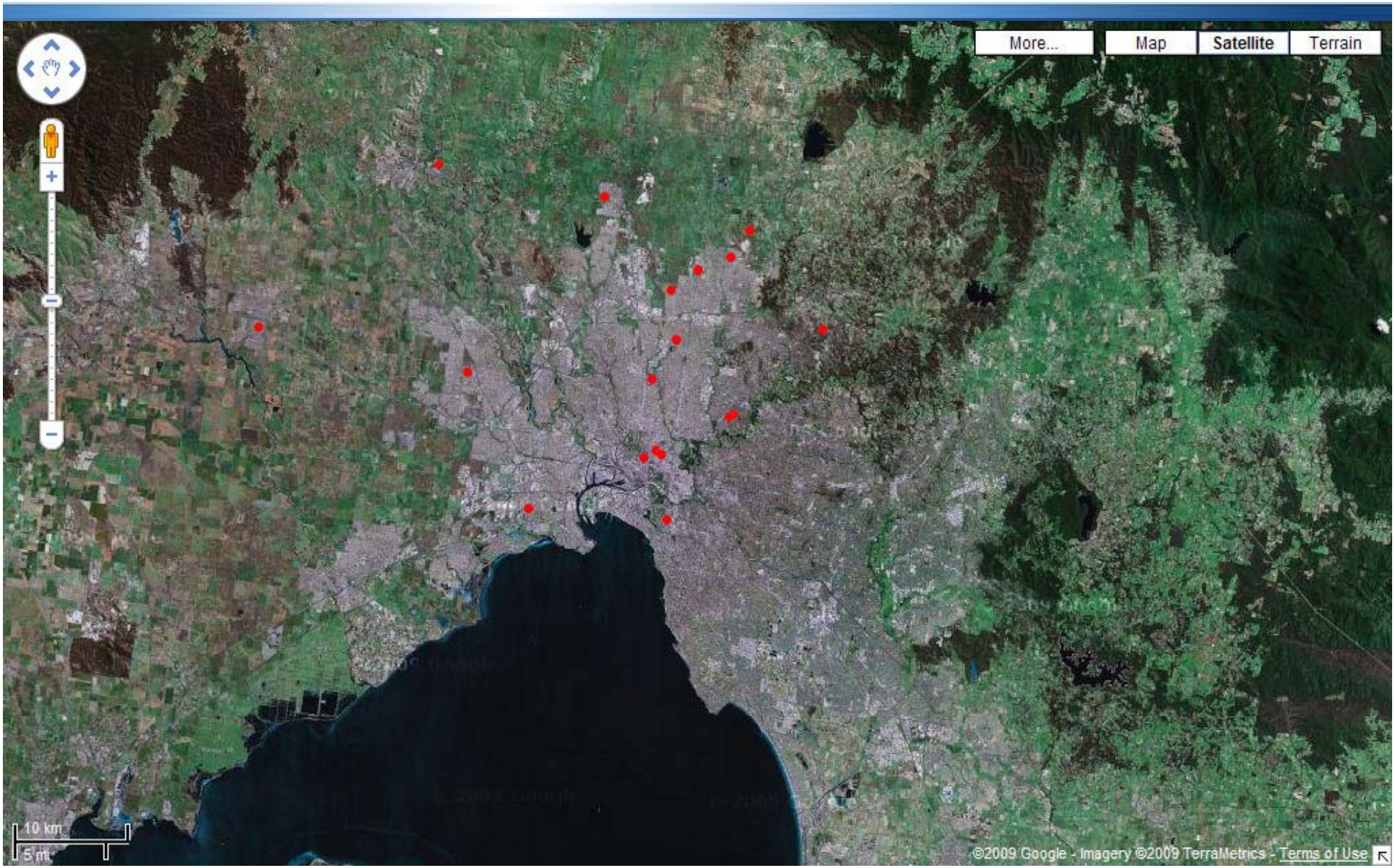
May 19 Day=2


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

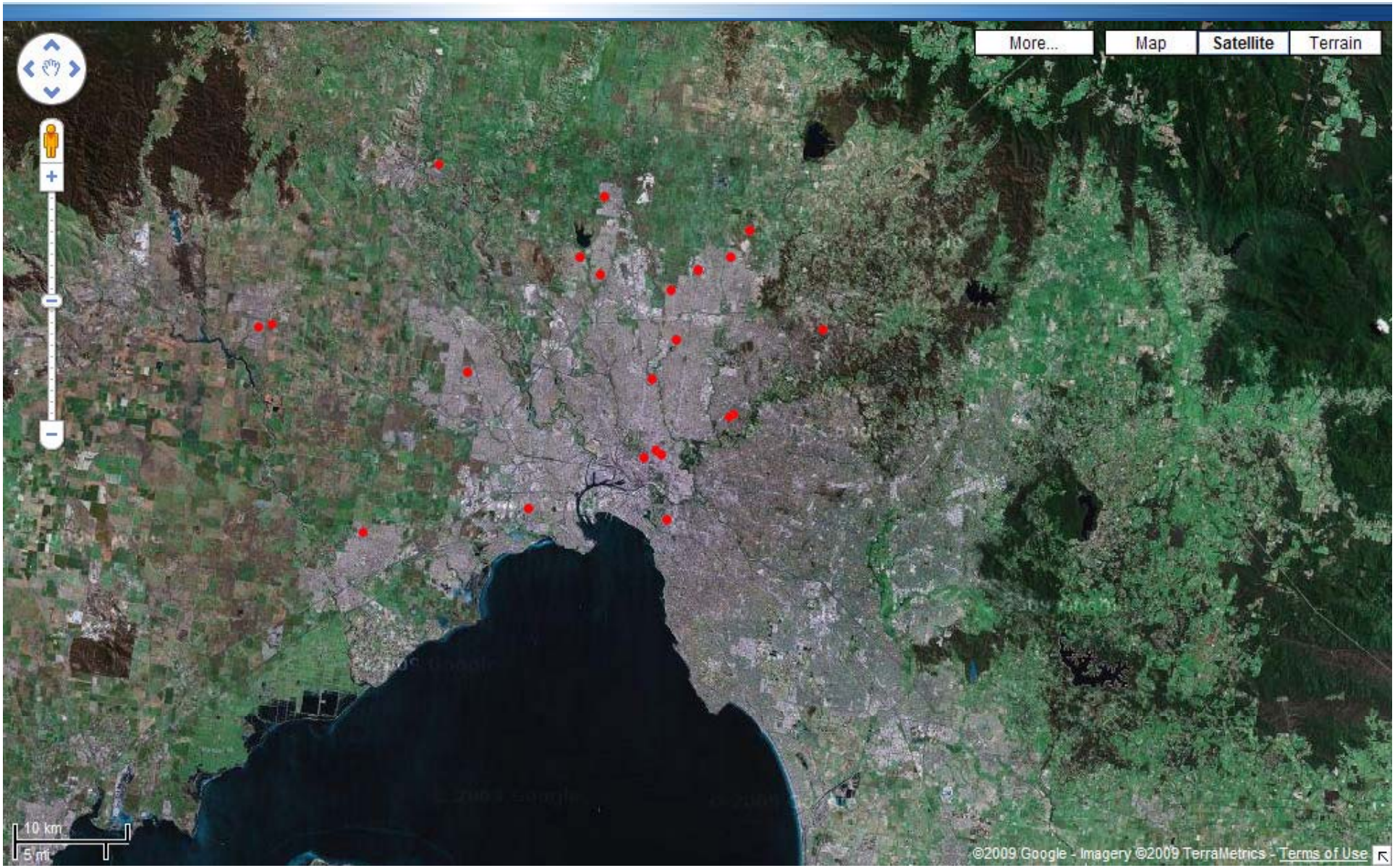
May 20 Day=3


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

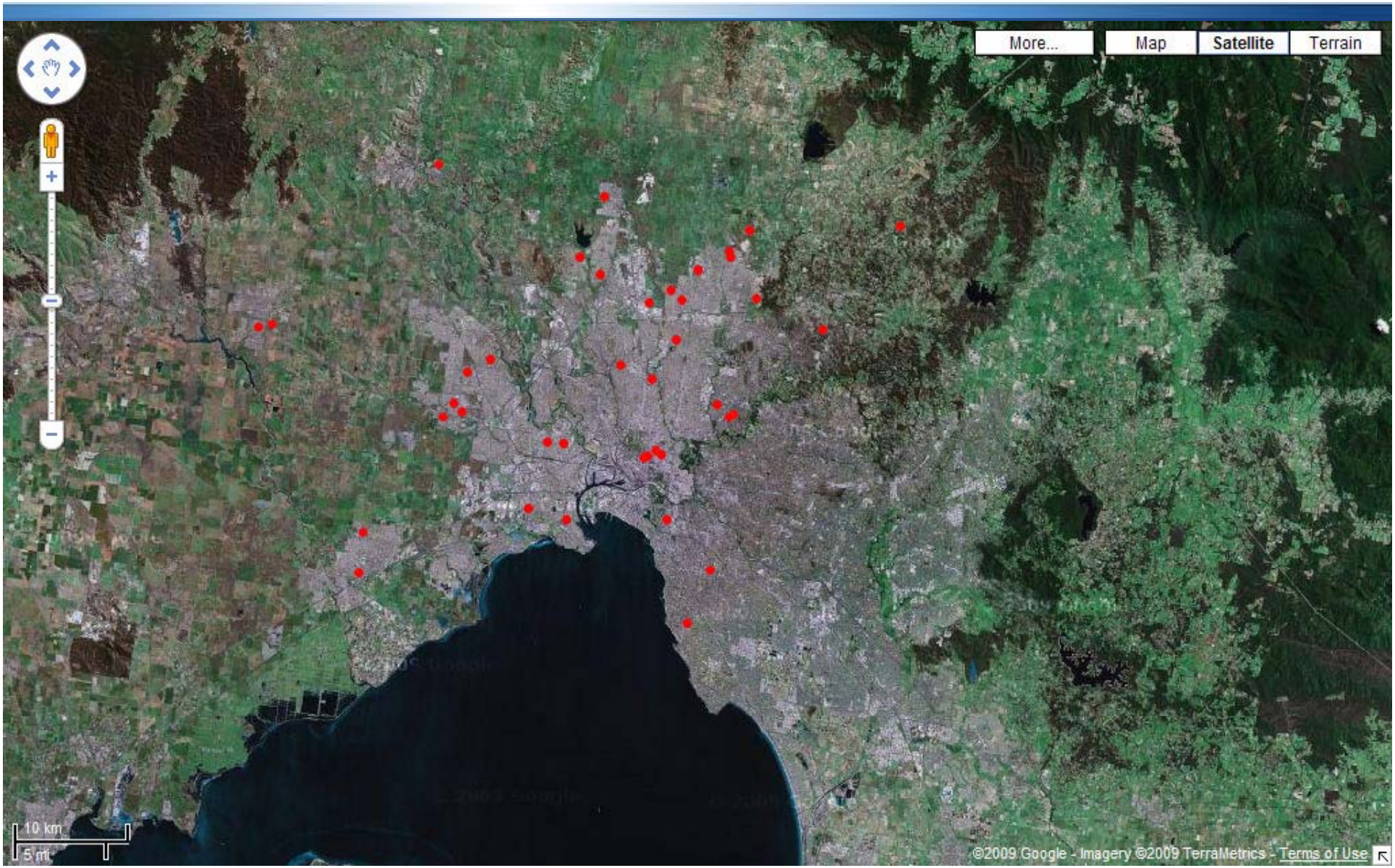
May 21 Day=4


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

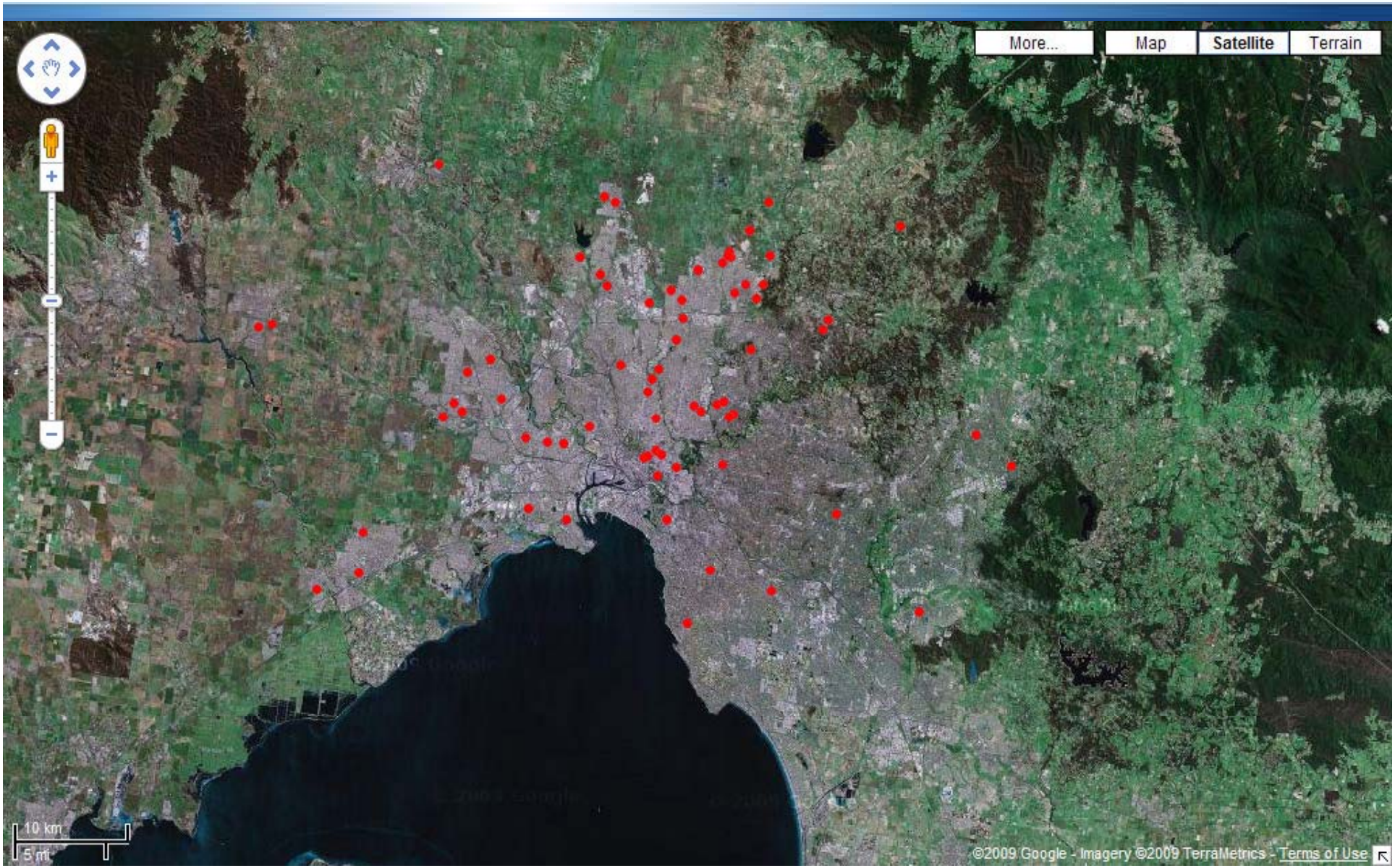
May 22 Day=5


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

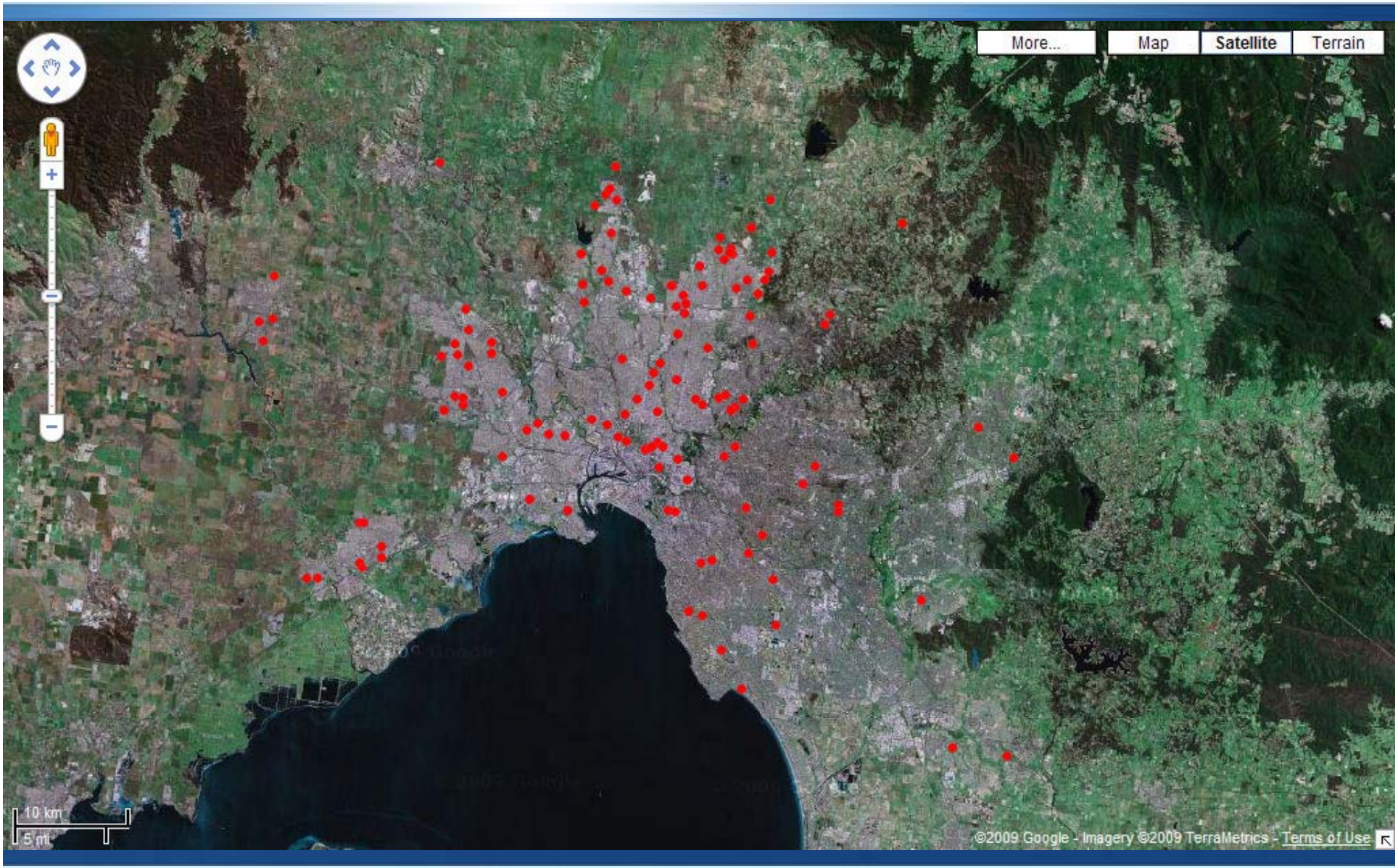
May 23 Day=6


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

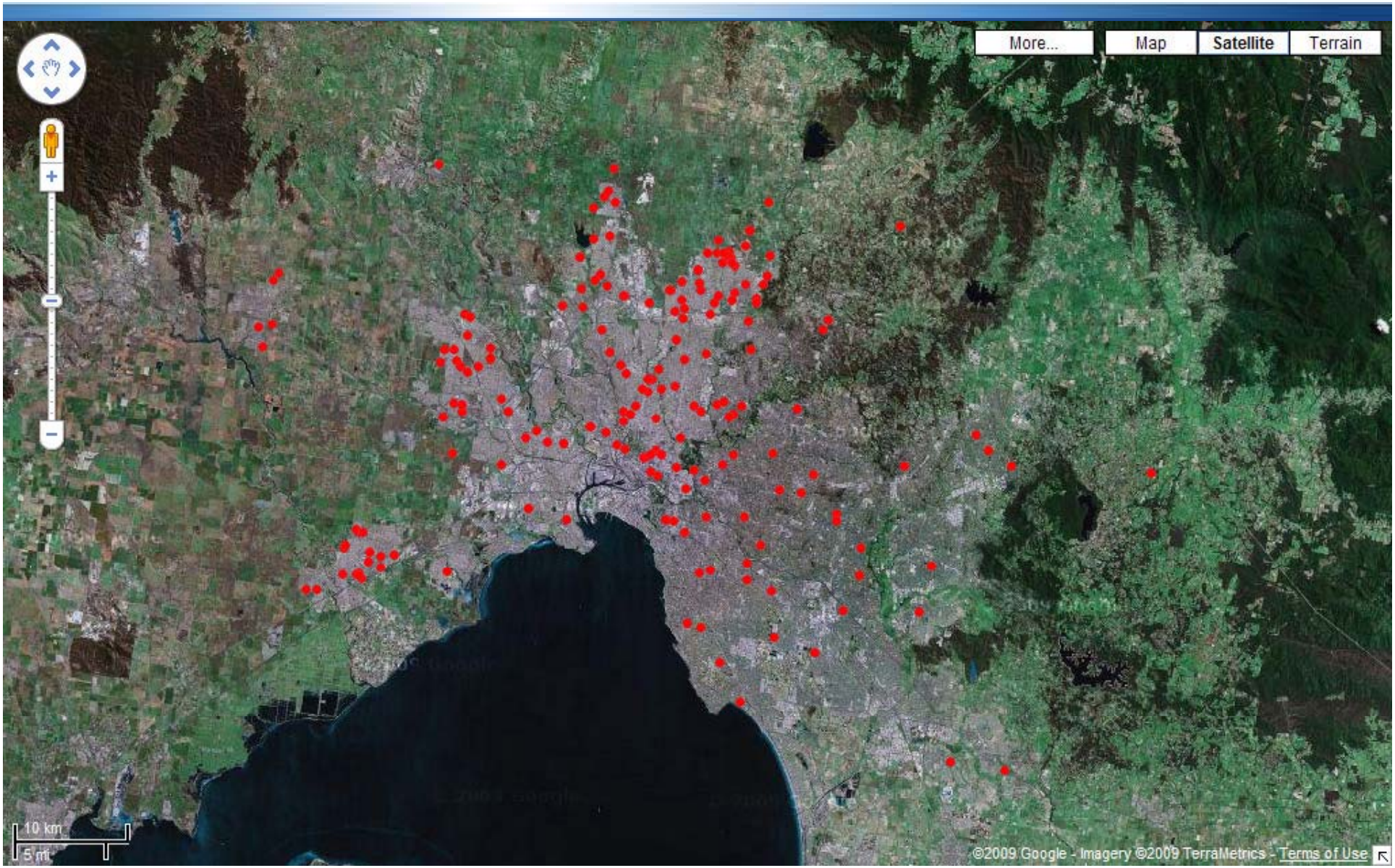
May 24 Day=7


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

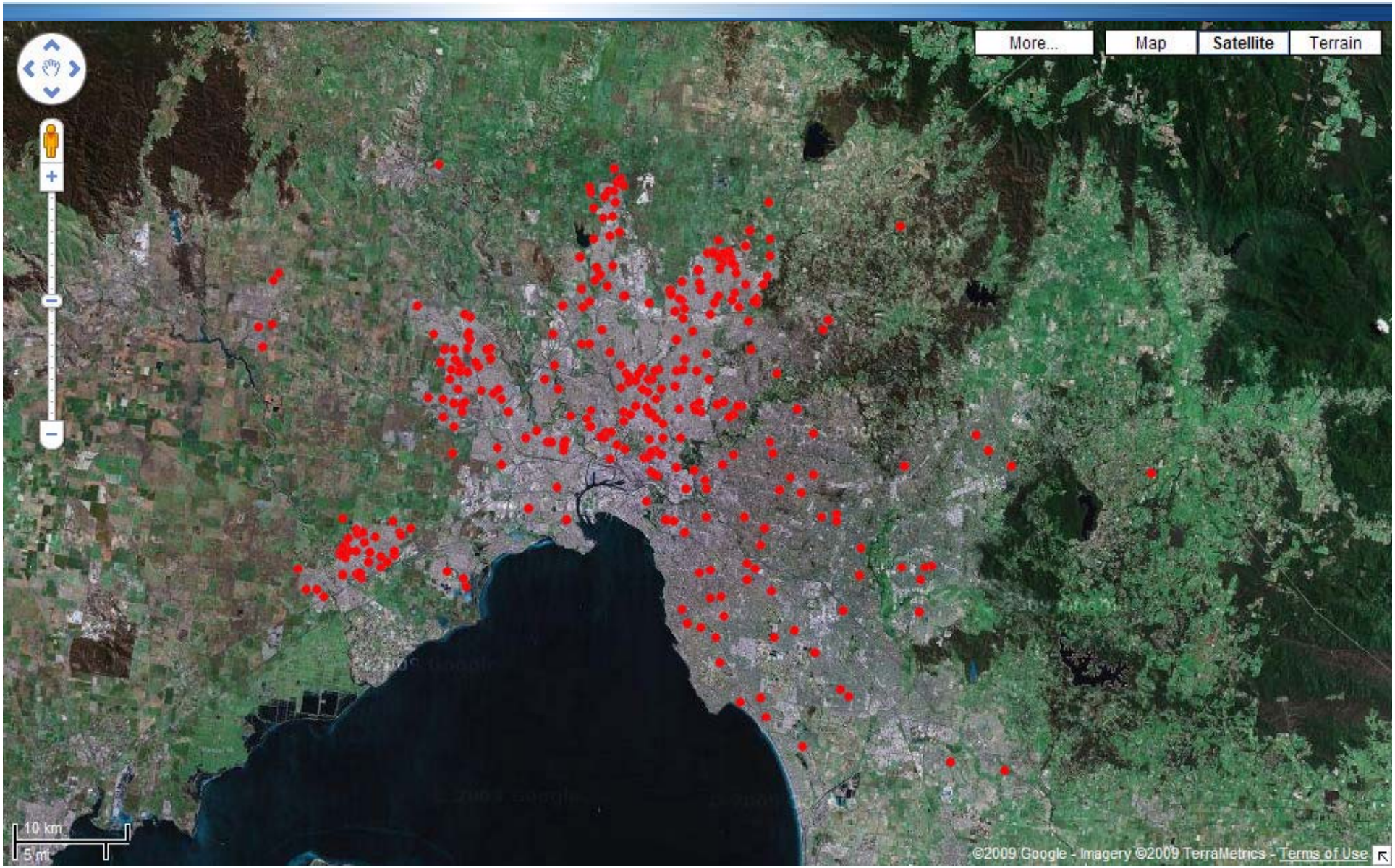
May 25 Day=8


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

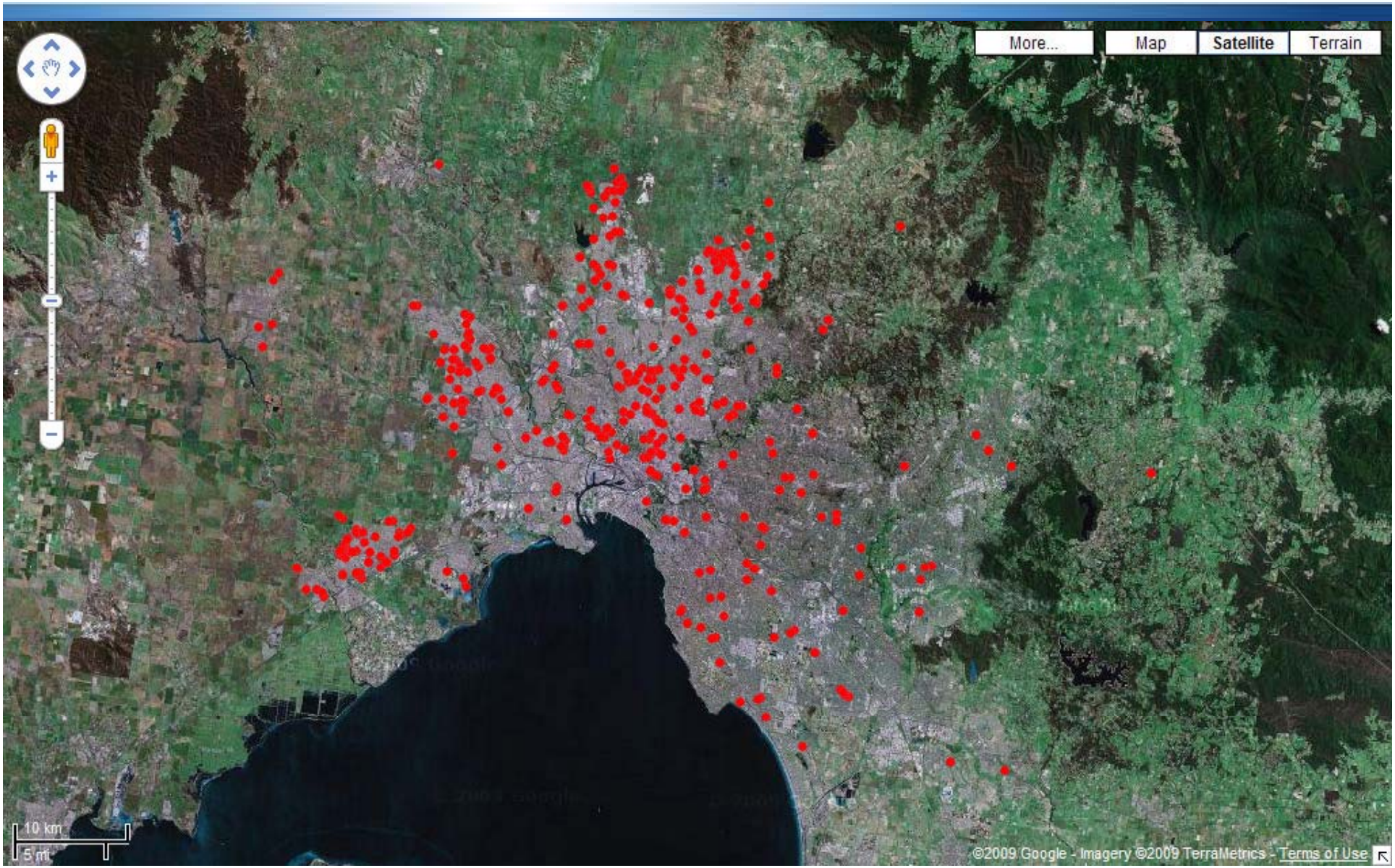
May 26 Day=9


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

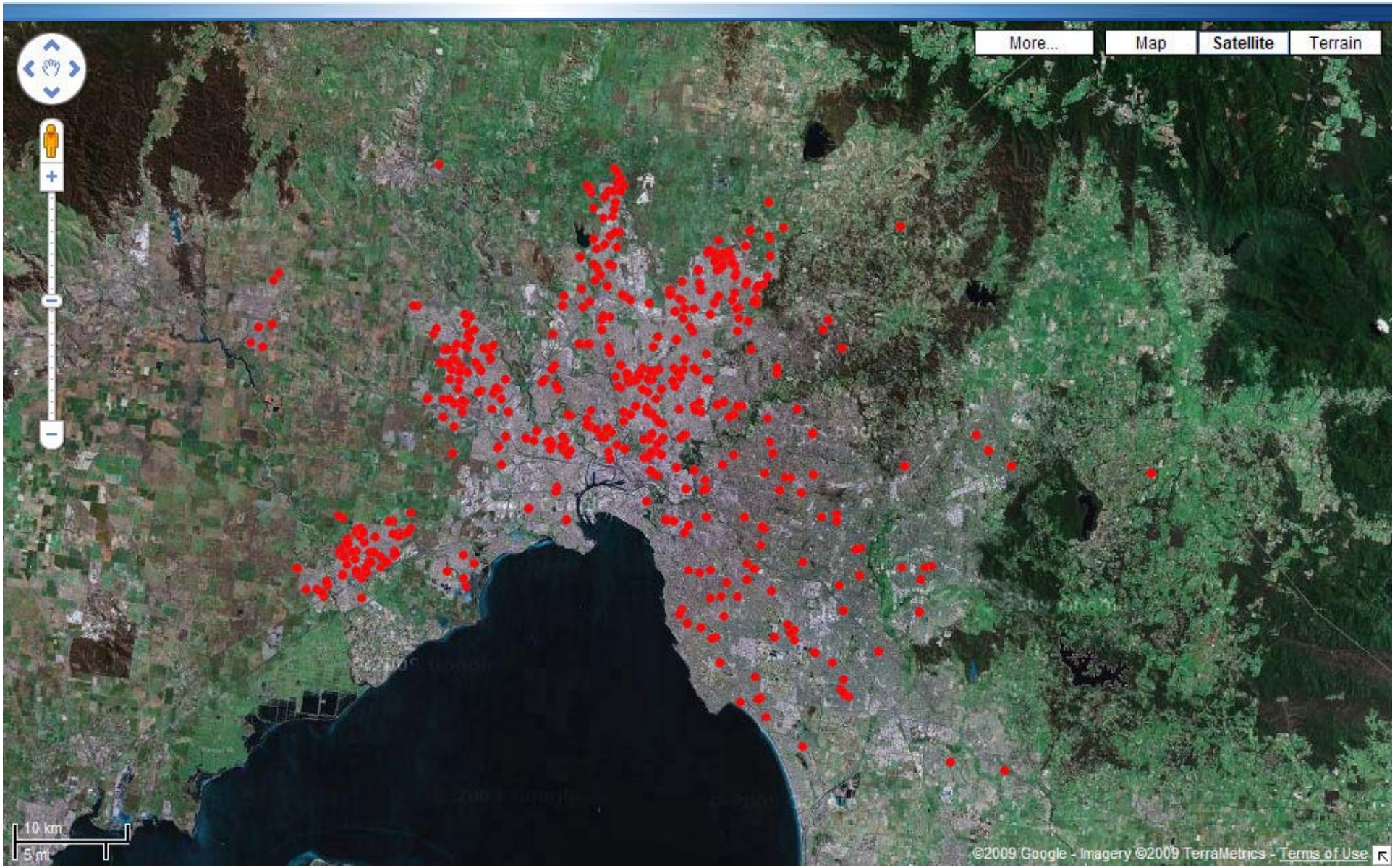
May 27 Day=10


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

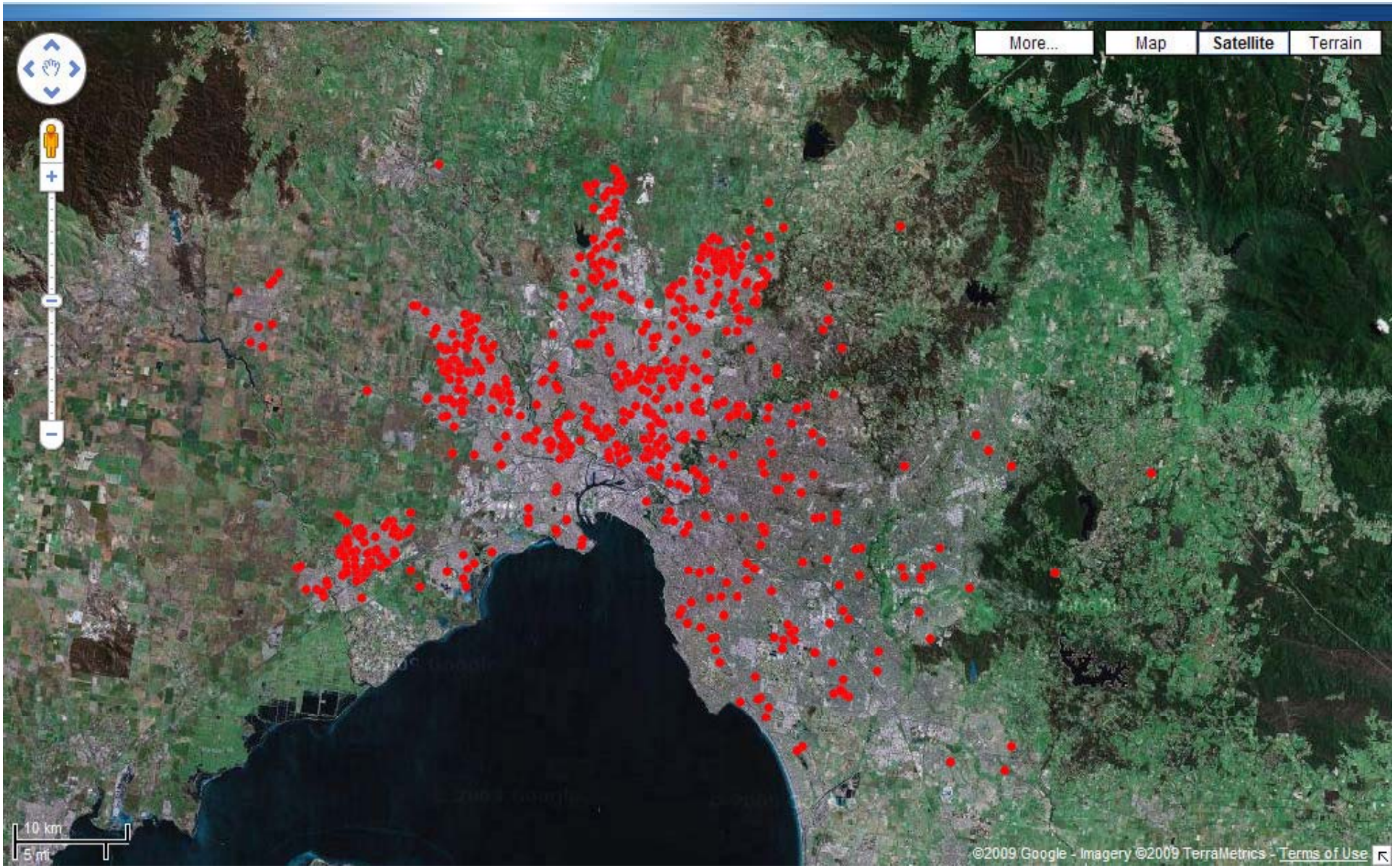
May 28 Day=11


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

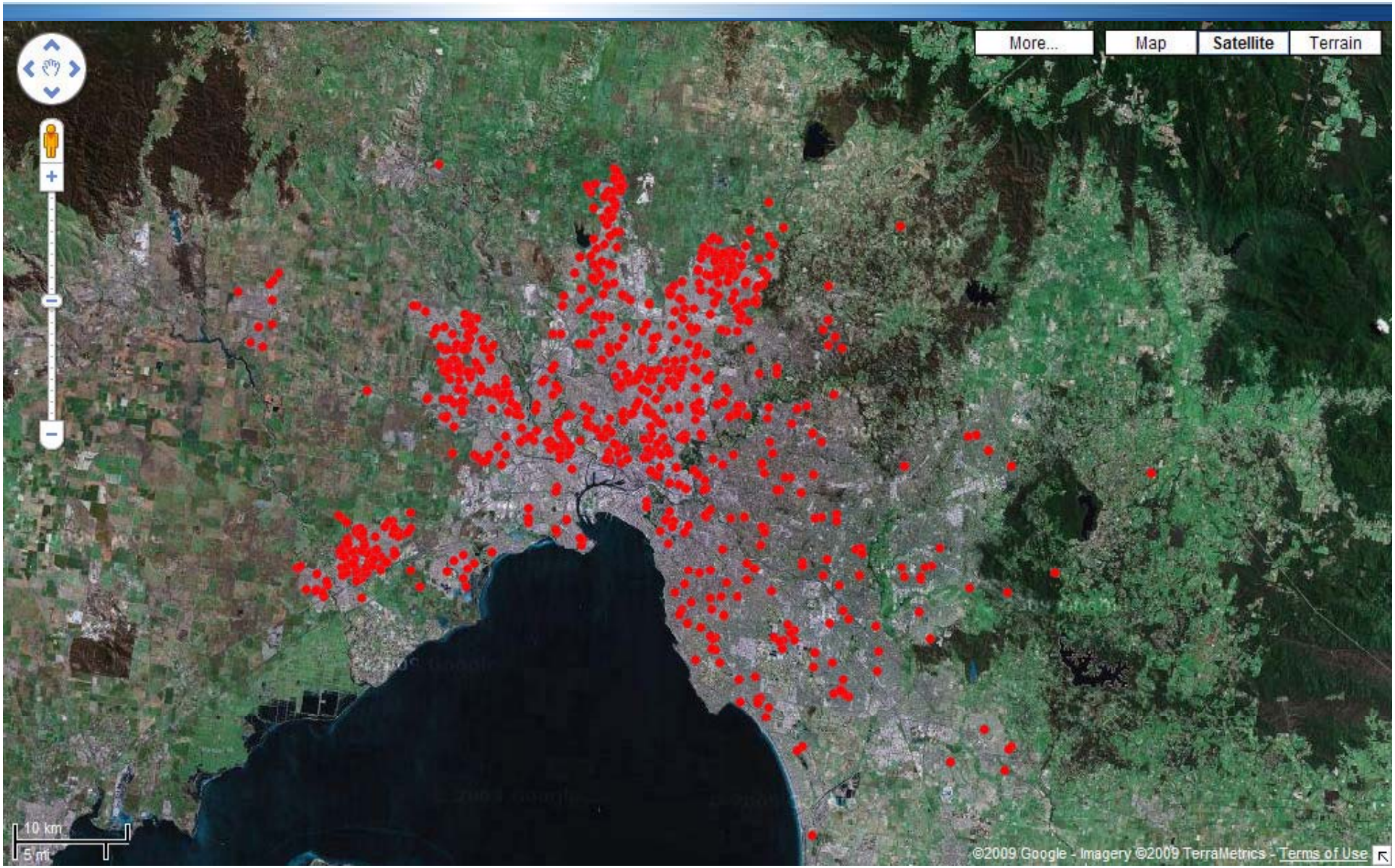
May 29 Day=12


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

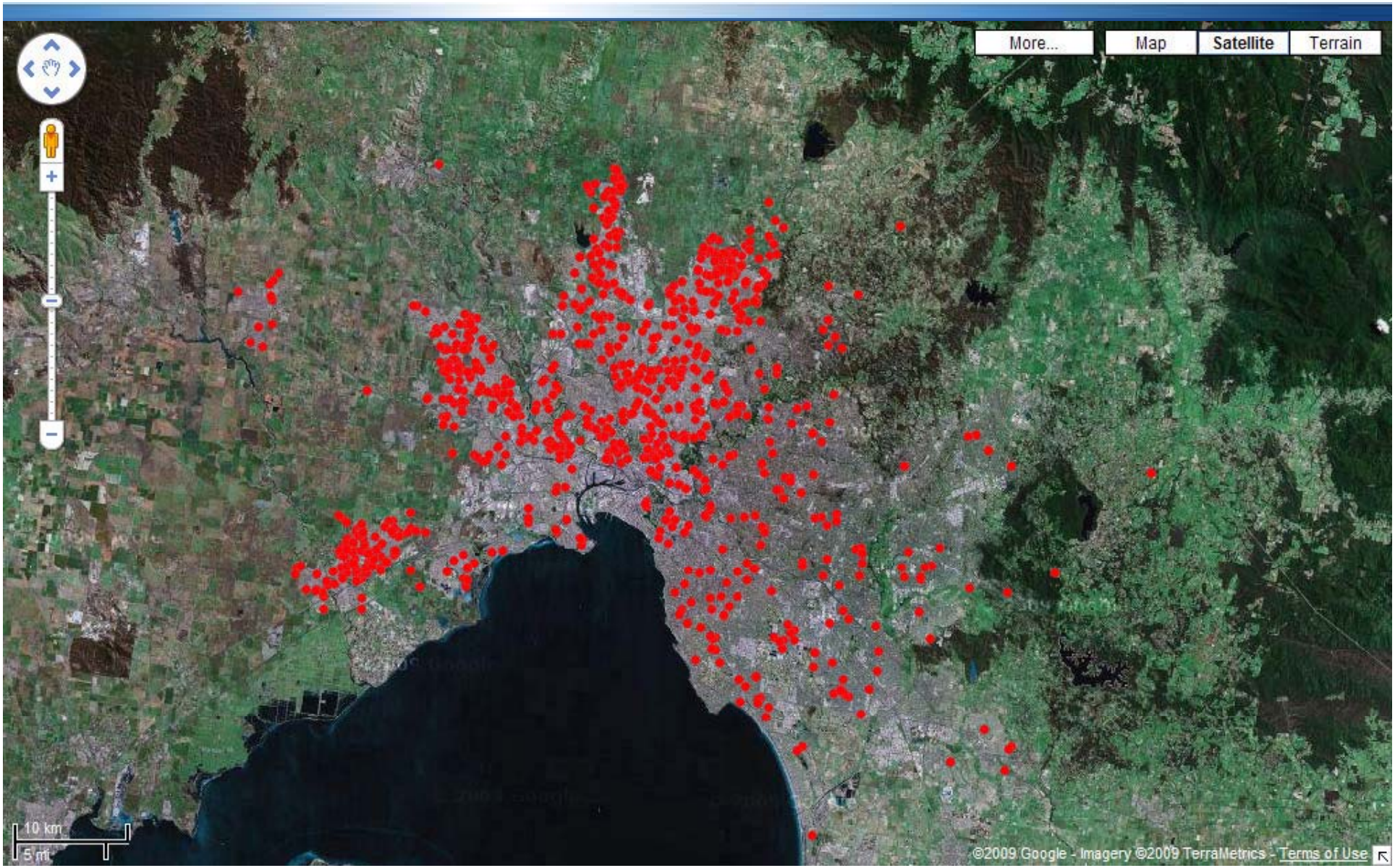
May 30 Day=13


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

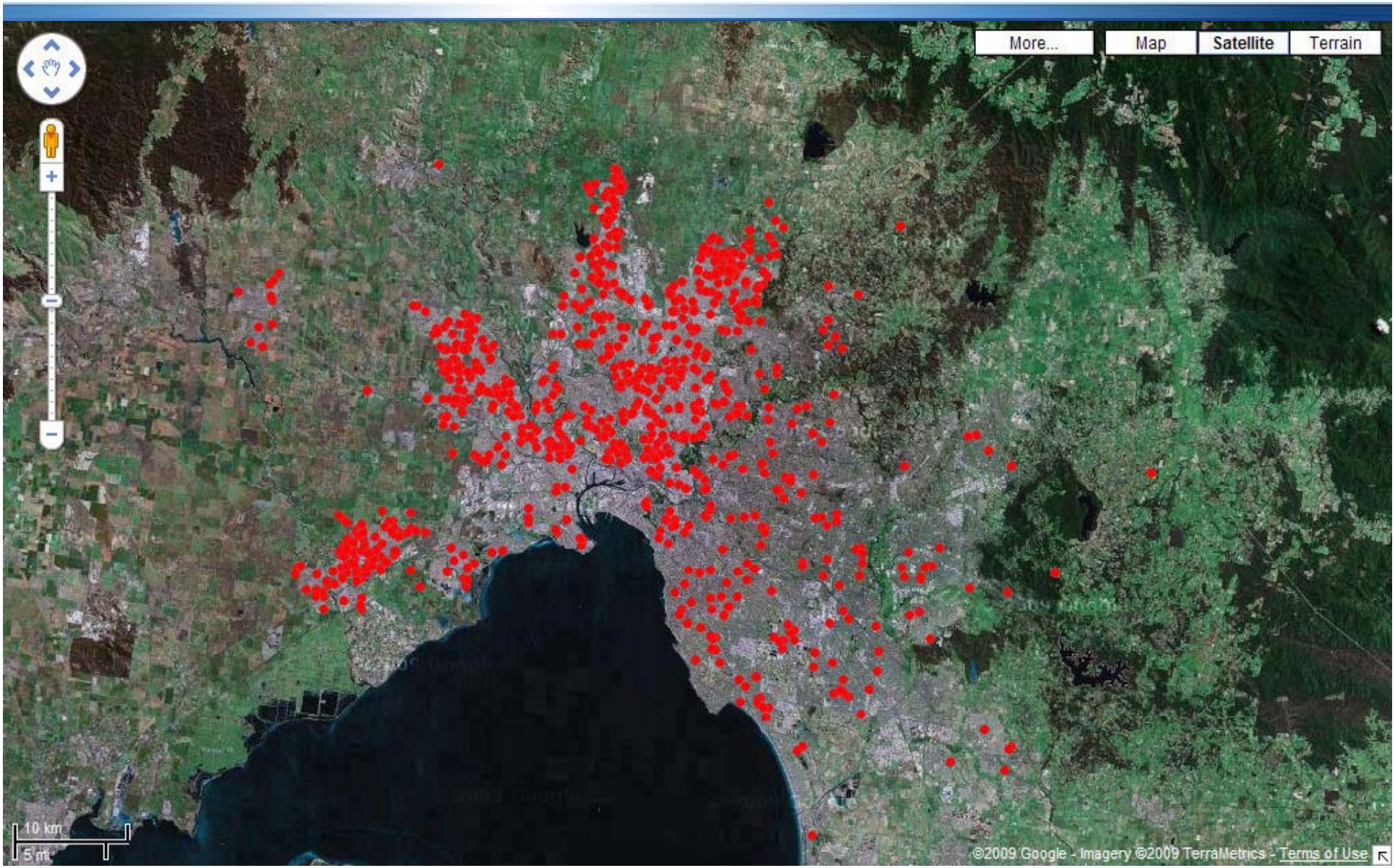
May 31 Day=14


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

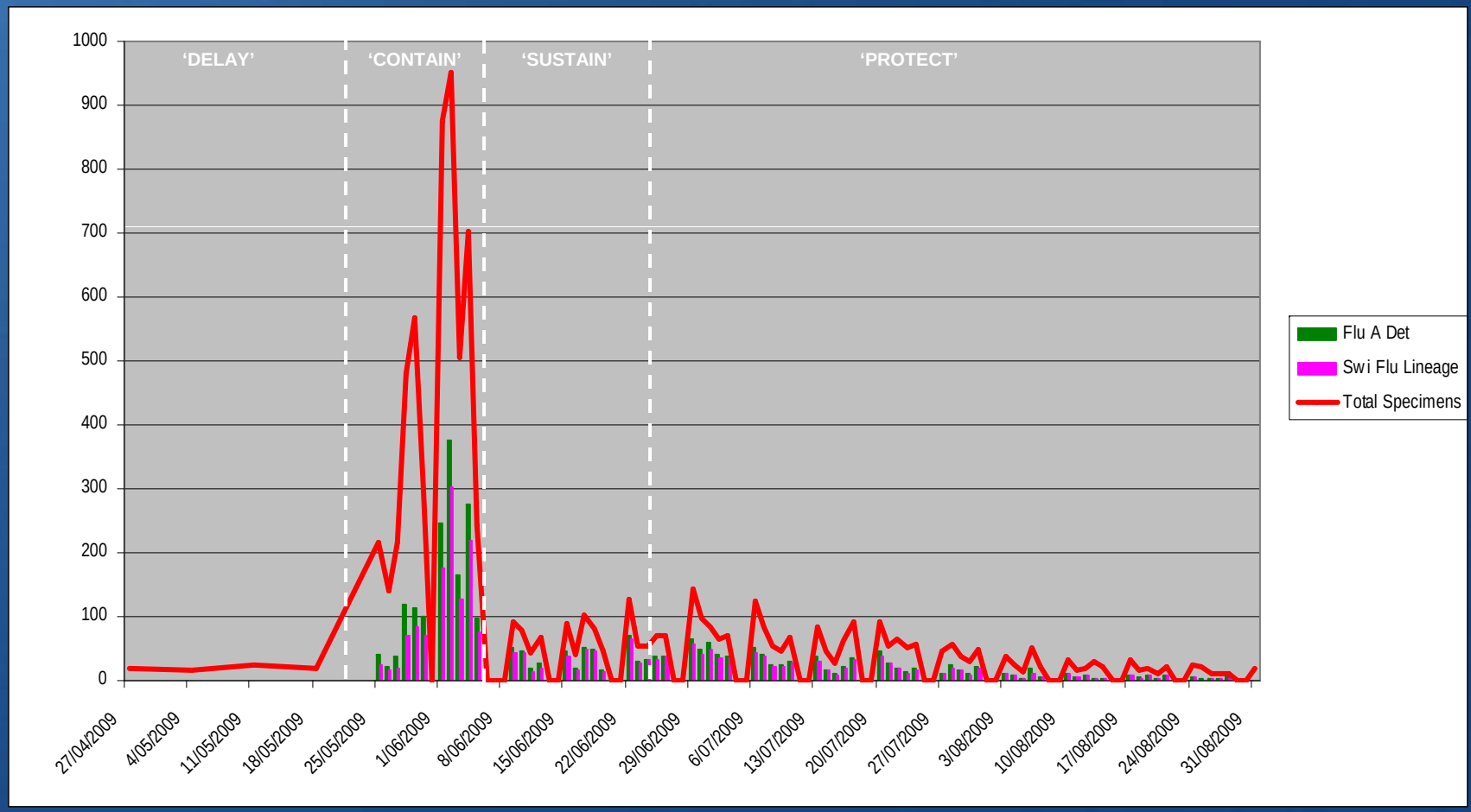
June 1 Day=15


More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

June 2 Day=16

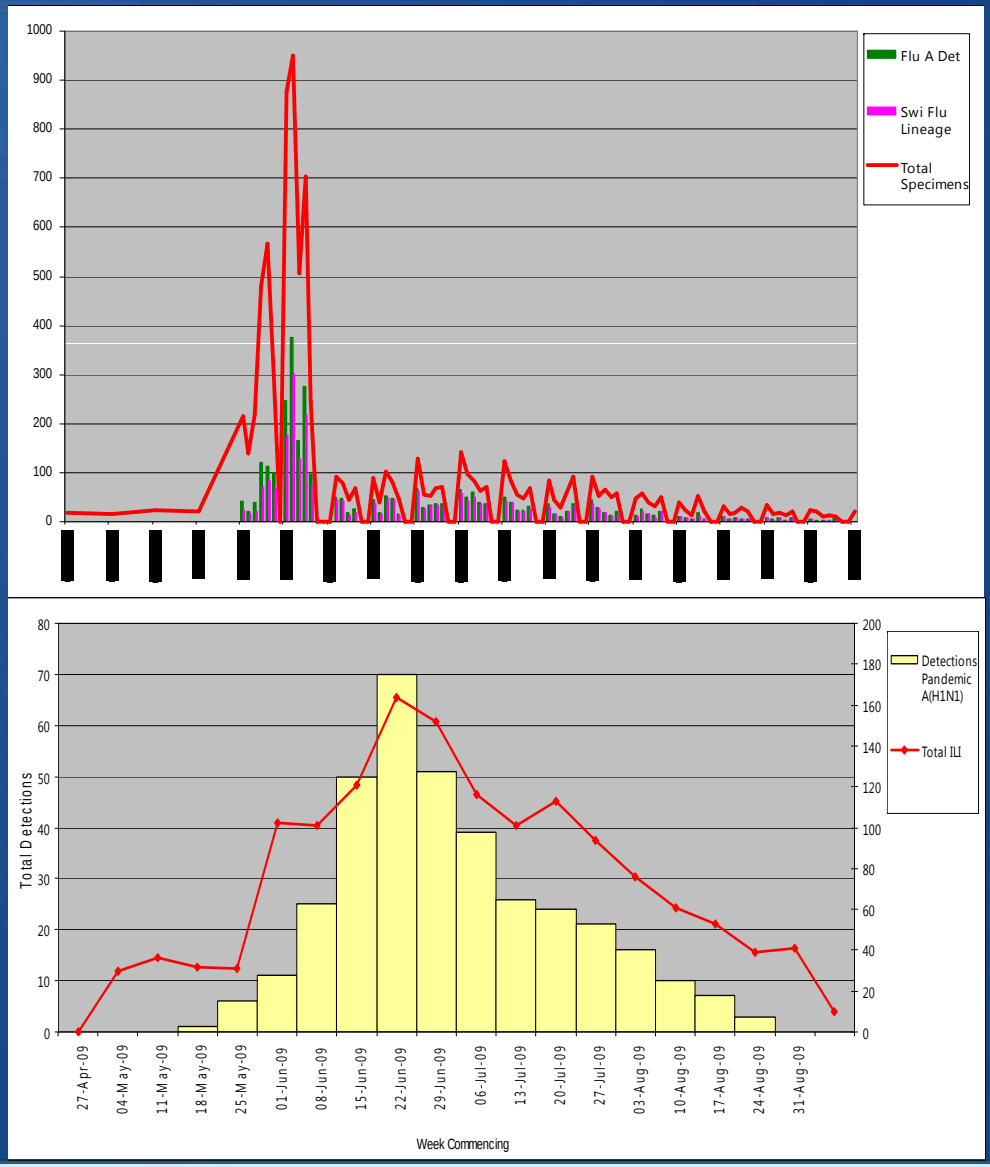

More...
Map
Satellite
Terrain
10 km
5 mi
©2009 Google - Imagery ©2009 TerraMetrics - Terms of Use

Influenza A H1N1 (2009) PCR Throughput Viral Identification (VI) Laboratory VIDRL 'SUSTAIN' & 'PROTECT' Phases

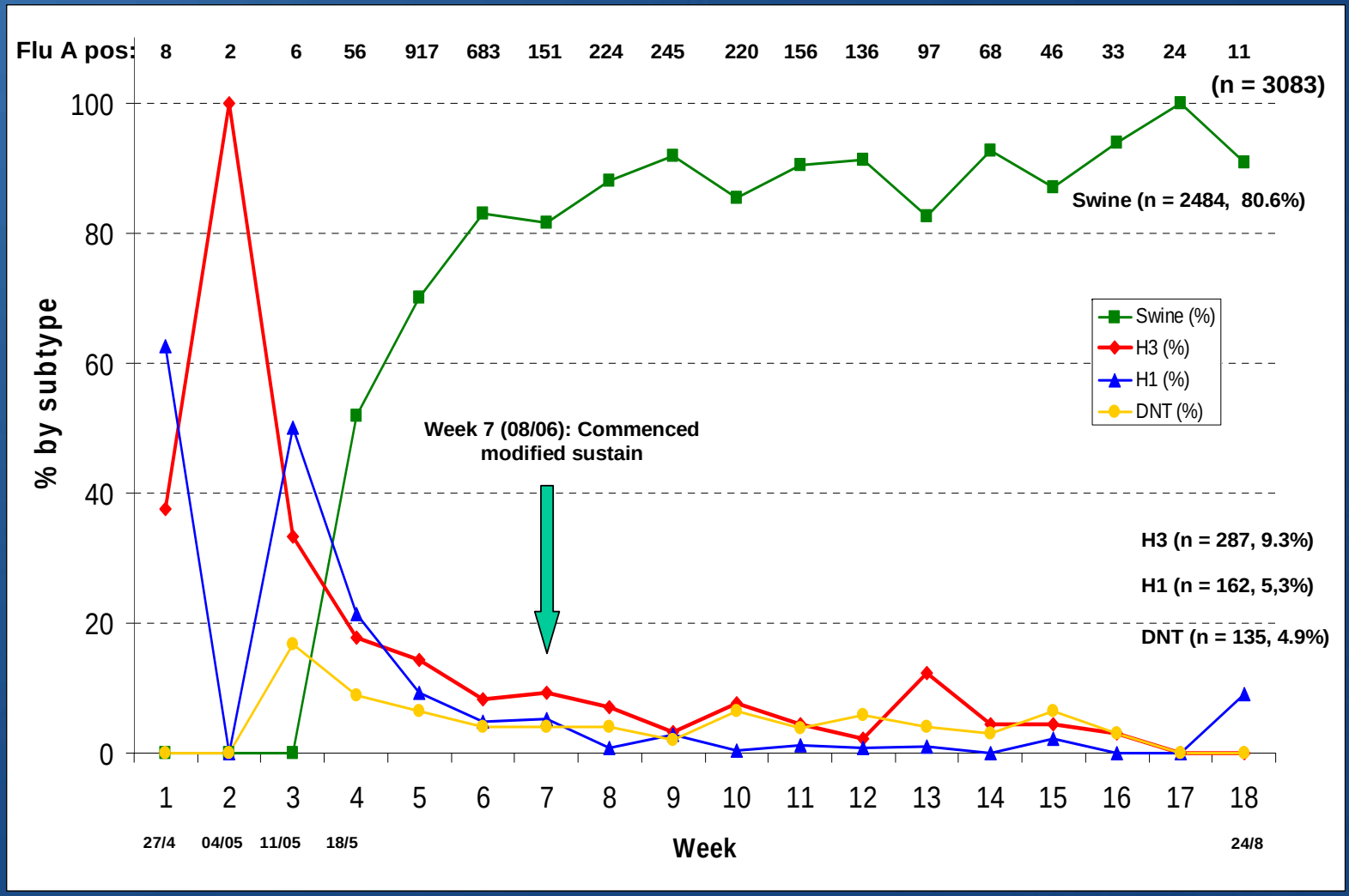


Complementary Laboratory Activity:

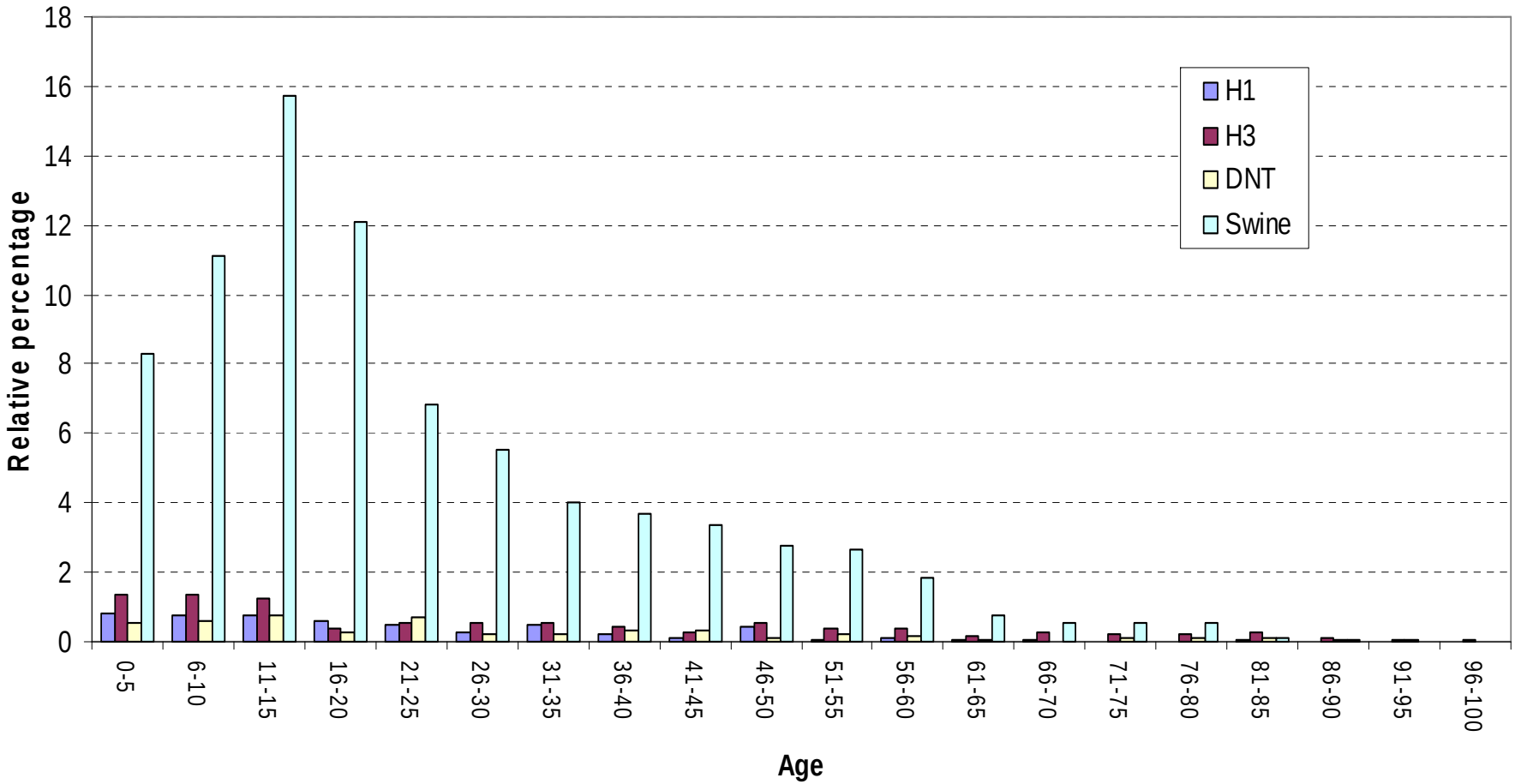
(i) Clinically focussed testing during 'SUSTAIN' & 'PROTECT'
(ii) Sentinel Surveillance Influenza H1N1 (2009) detections and ILI



Influenza A Subtypes VIDRL Winter 2009

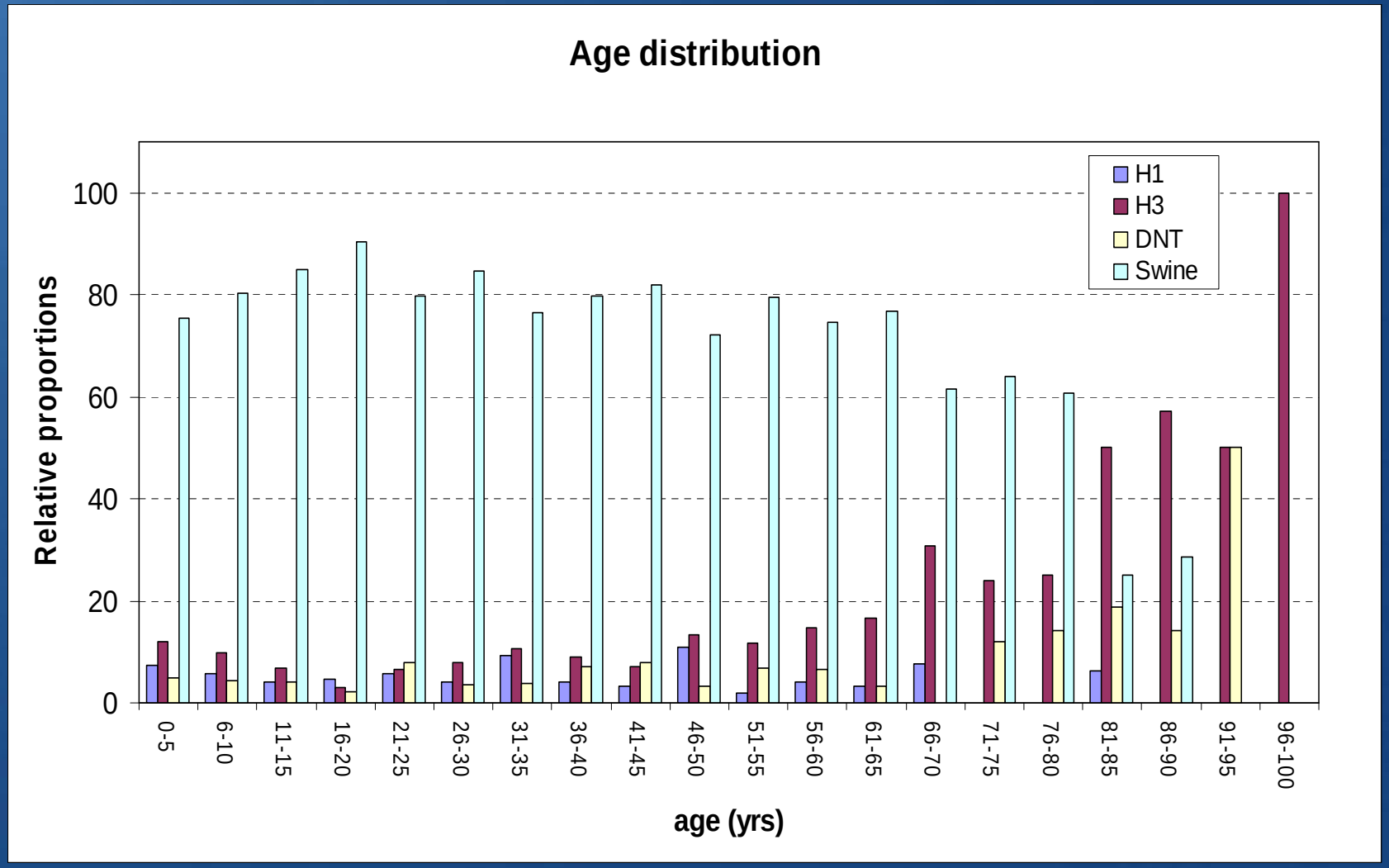


Age Distribution of Influenza A Subtypes VIDRL Winter 2009
(Percentage of each subtype by age)

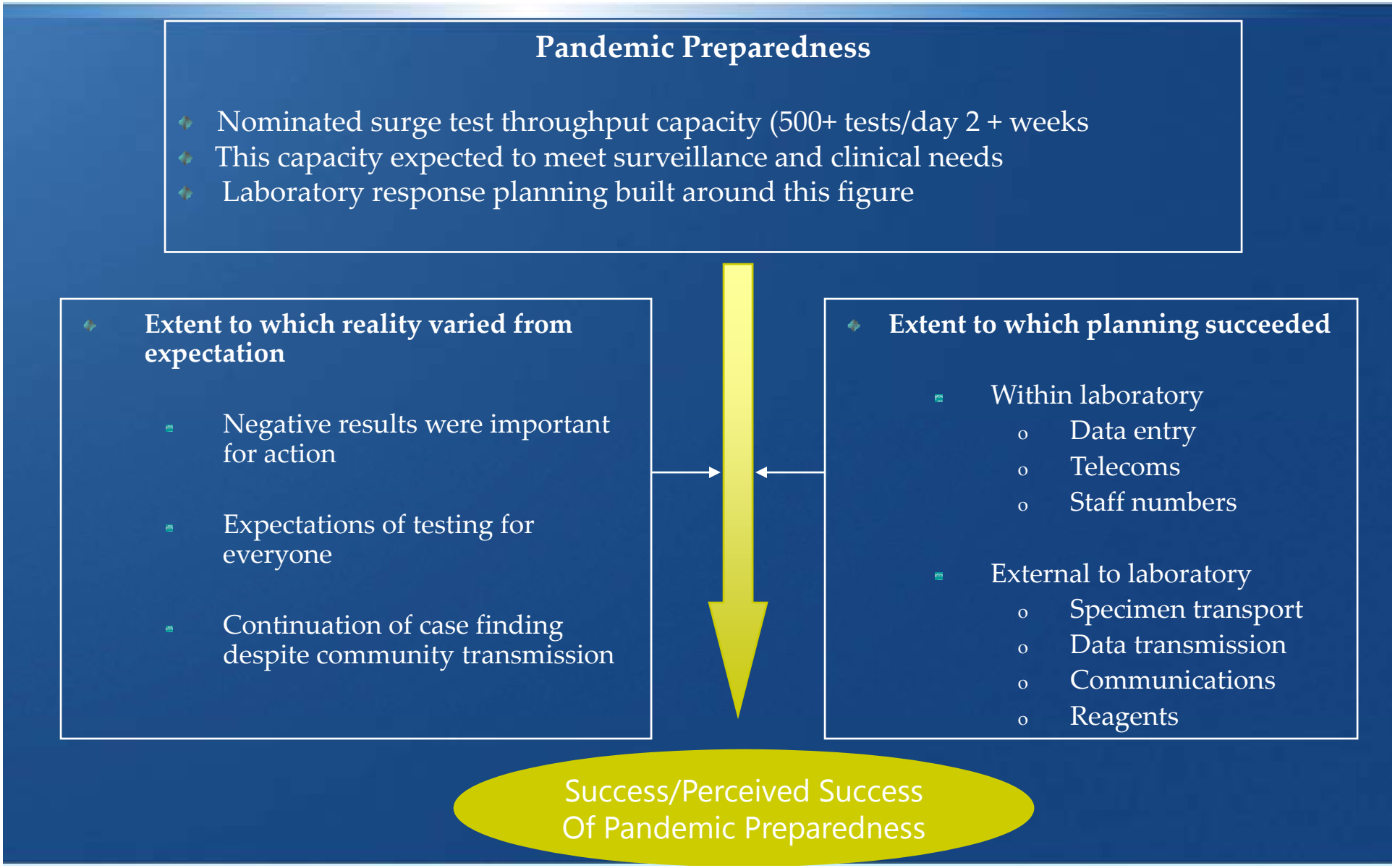


Age Distribution of Influenza A Subtypes VIDRL Winter 2009

(relative proportions of subtypes within each age-group)



Planning & Reality



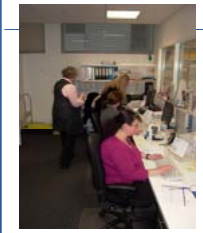
Expectation and Reality

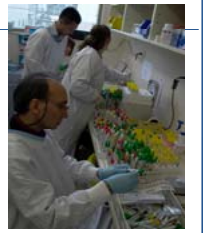
- Negative results of influenza testing were important: cessation of antivirals and release from quarantine.
- Expectations from public/primary care of laboratory testing of all respiratory illnesses
- Continuation of case finding and laboratory testing despite widespread community transmission

Success of Planning Within the Laboratory

Plan	In Practice
Facilities	
▪ Outbreak specific PCR Laboratories	▪ Worked well
▪ Dedicated outbreak specimen reception area	▪ Not available during outbreak
Equipment	
▪ Nucleic acid extraction robotics	▪ Worked well
▪ Real time PCR analysers	▪ Worked well

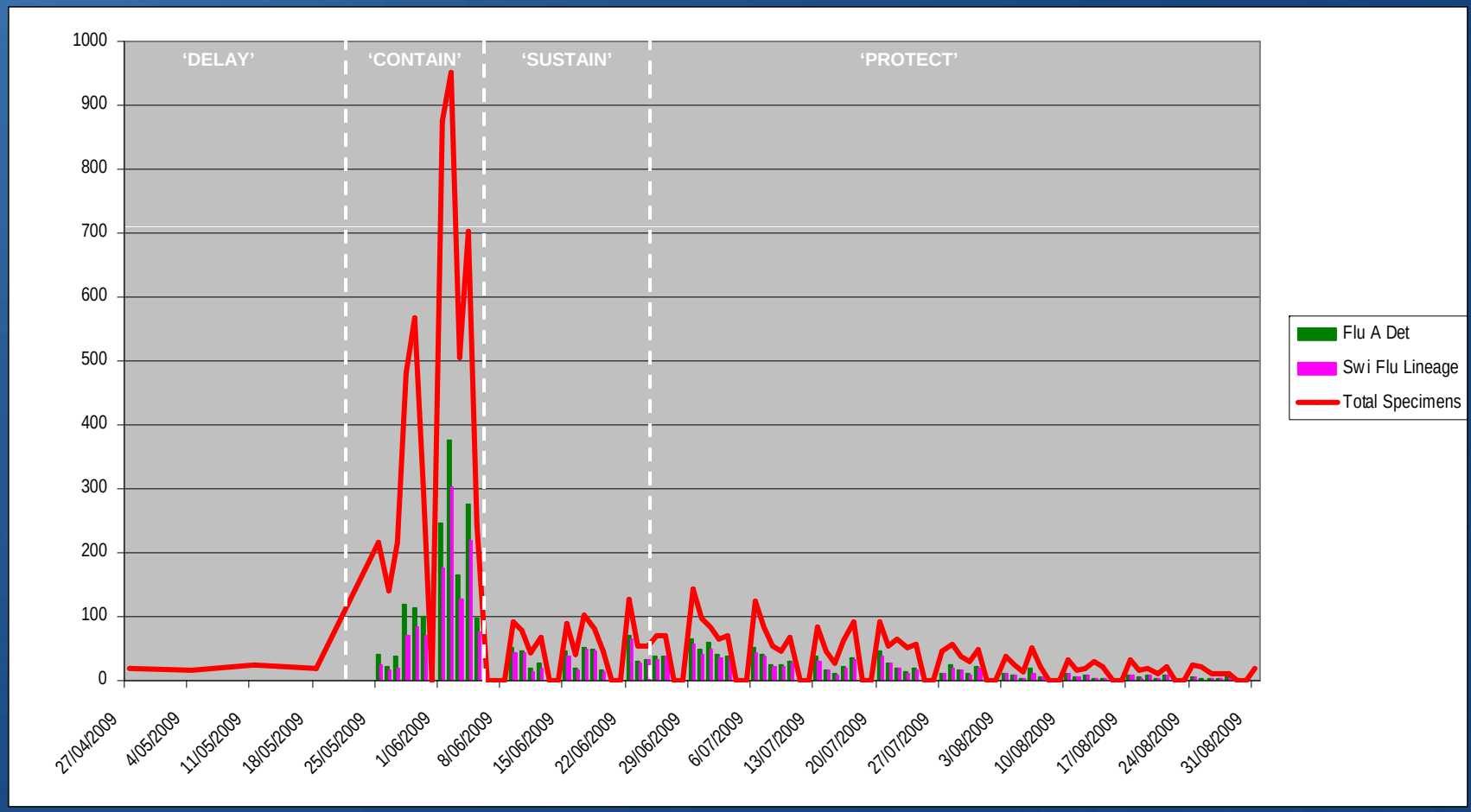
Success of Planning within the Laboratory





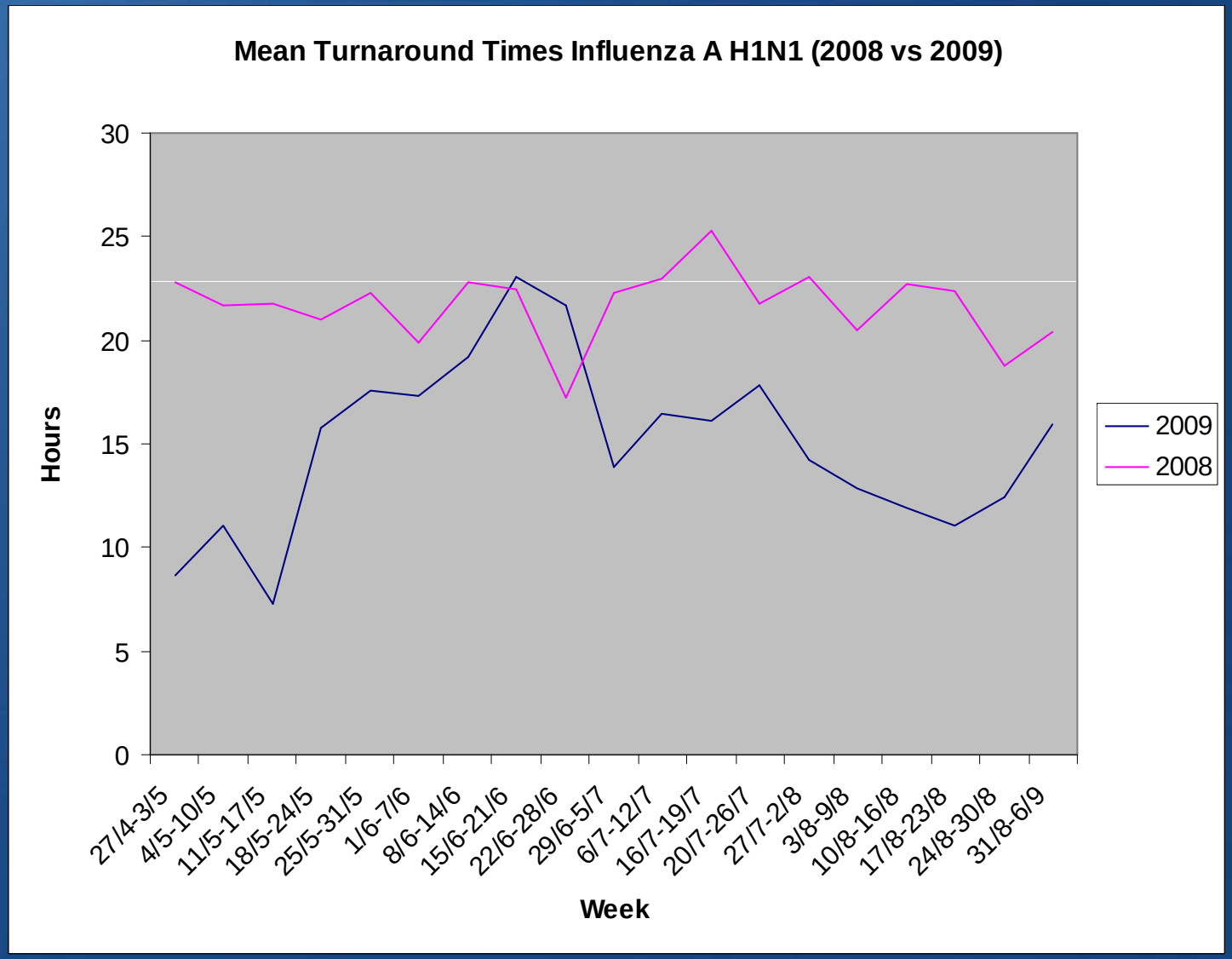
Plan	In Practice
Staffing	
▪ 2 additional multi-trained scientists	▪ Extremely helpful, but still short-staffed
▪ Supplementary staff from 'quiet areas'	▪ Quiet areas busy covering support staff tasks
▪ Secretaries cross trained in data key entry	▪ Not fast enough
▪ Switchboard manning from 'quiet areas'	▪ Quiet areas busy
Reagents	
▪ Stockpile of non-perishable reagents	▪ Ran critically low on perishable reagents (eg reverse transcriptase)

Influenza A H1N1 (2009) PCR Throughput Viral Identification (VI) Laboratory VIDRL 'SUSTAIN' & 'PROTECT' Phases

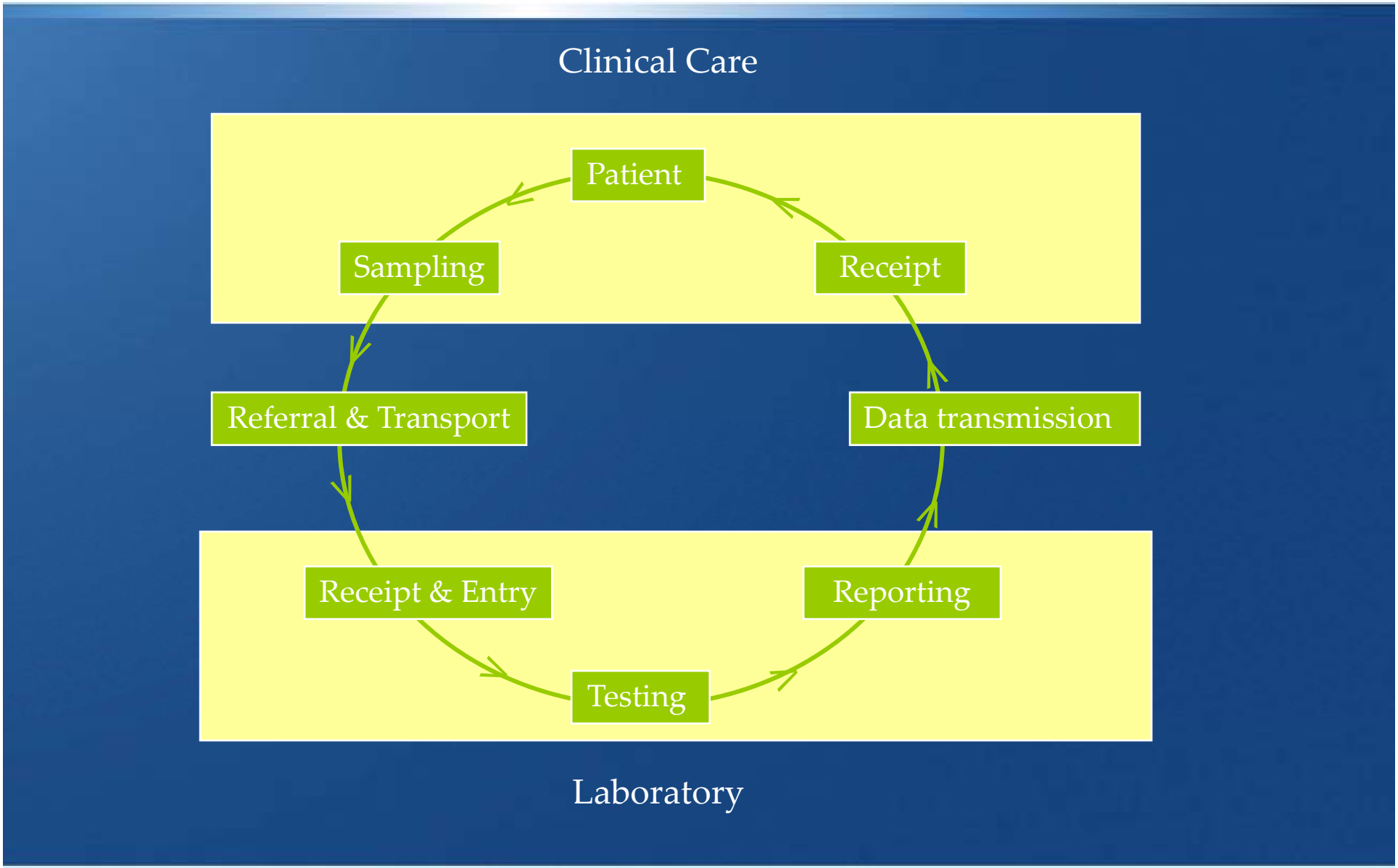


Mean Turnaround Times (hrs) Influenza A H1N1 (2009)

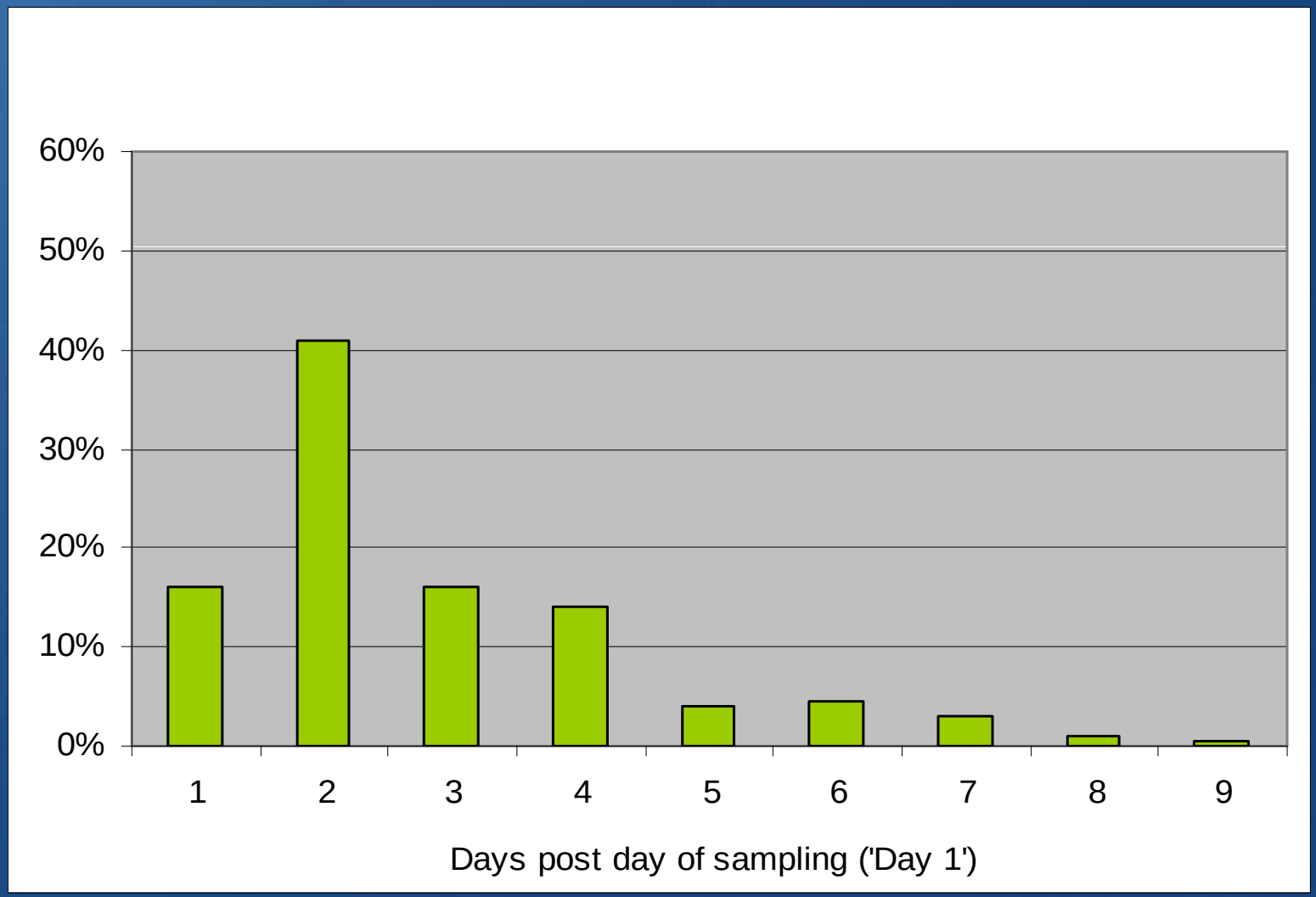
PCR VIDRL May-July



The Testing Cycle



H1N1 (2009) Positive Samples: Transit times to VIDRL (Days)



Victorian Aged Care Facility Respiratory Outbreaks Investigations: Laboratory Diagnoses

	2004	2005	2006	2007	2008	2009
Picornaviruses	2	1	0	1	2	1
RSV	0	2	0	1	2	2
Influenza A H3	0	1	1	9	5	1
Influenza A H1	0	0	0	1	0	0
Influenza B	0	0	0	3	1	0
Other	0	0	0	1*	0	0
No diagnosis	0	0	0	3	4	1

* Adenovirus as part of a mixed outbreak with RSV & Flu A