

Safe roads, Reliable journeys,
Informed travellers



M25 Controlled Motorway

David Wright



The Highways Agency's Network

Highways Agency Network

- England only!!
- 5,800 miles of motorways and trunk roads
- Value - £55 billion (£55,000,000,000)
- Budget £1.5 billion pa
- <5% of English road network
- >30% of traffic (veh/km)
- >60% of HGV traffic (veh/km)



Development of Motorway Control



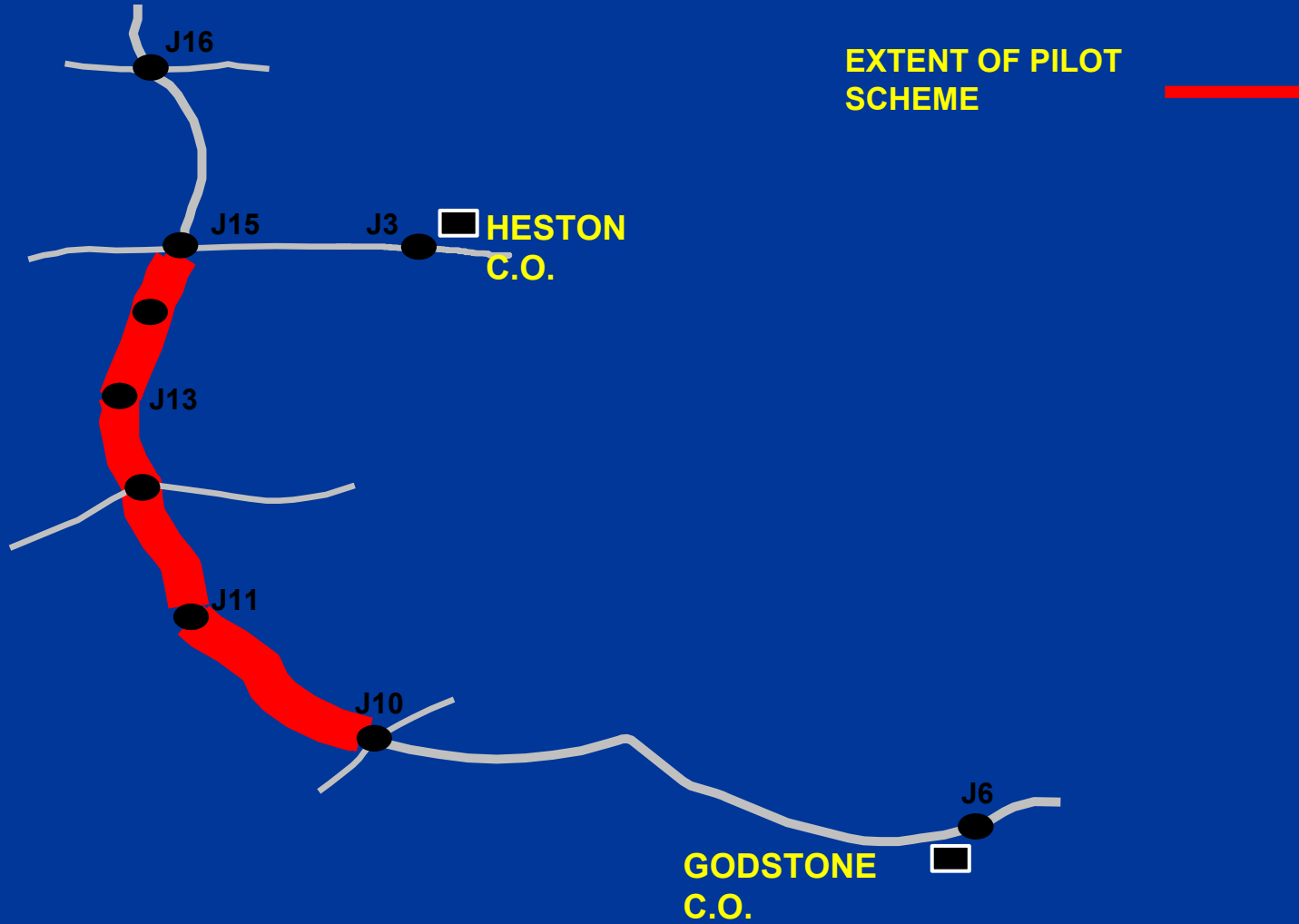
Background

- M6, Birmingham – late 1980s
 - ❖ Advisory 50mph limits
 - ❖ Flow monitoring, manual control
 - ❖ Poor compliance, no impact on congestion
- **Lessons – to be effective need..**
 - ❖ Automatic Control
 - ❖ Mandatory Speed Limits
 - ❖ Enforcement



The Highways Agency's Network

M25 Controlled Motorway Pilot



Why M25?

- 'Busiest Motorway in Europe'
- Gantries and Enhanced Message Signs already installed
- Communications available
- Only D4 motorway at that time

The Theory

- Speed/flow curve
- Higher flow, reduced speed
- Max throughput @ 52mph?
- Unstable, flow breakdown
- Much lower throughput

Control speed >> maintain flow?

Go slower to get there faster!

Key Features

- Mandatory Signals
- Automatic Enforcement
 - ❖ Radar & 35mm 'wet' film
- Automatic Control – MIDAS
 - ❖ Flow (& speed) based control algorithm

Mandatory Signals

- Controlled Motorway Indicator
- Gantry/post mounted
- Fibre-optic based
- High visibility
- Higher reliability
- Optional interface to enforcement
- **Very well received**

Mandatory Signals



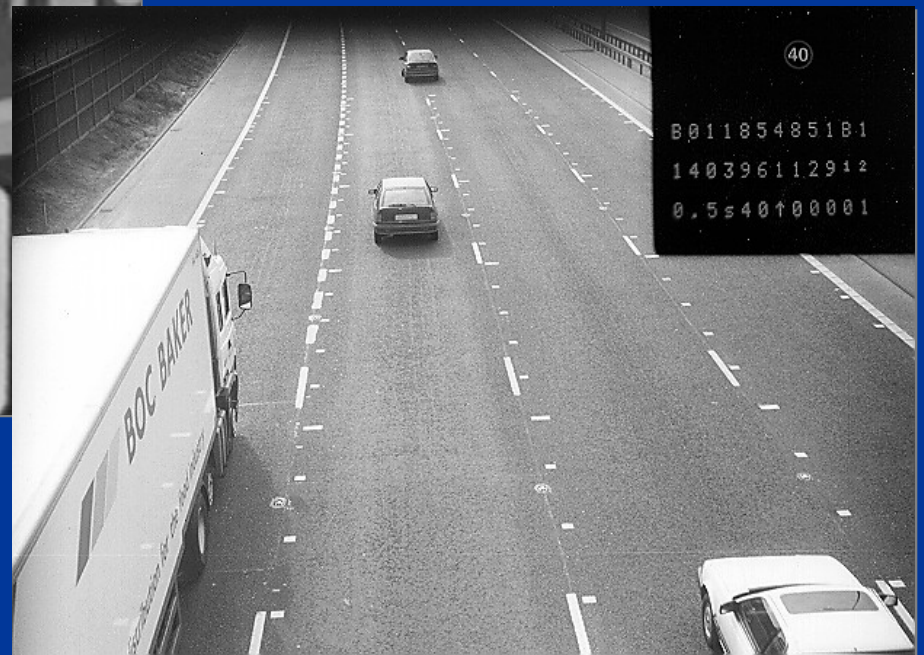
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Enforcement System

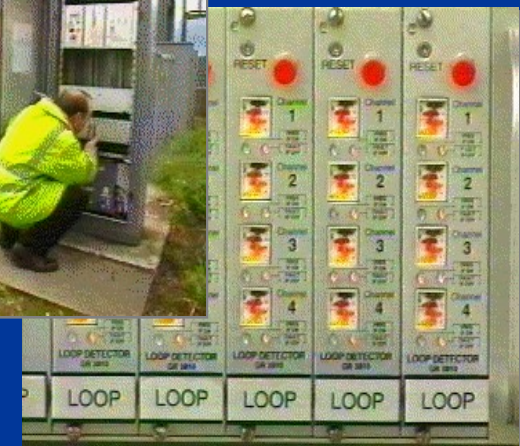
- 35mm 'wet' film
- Radar speed detection
- Gantry mounted
- Individual lane monitoring
- Enforce all limits (20-70mph)
- **Flash is essential!**

M25 Enforcement System



MIDAS System

- Loops (or alternatives)
- Roadside/central computers
- Algorithm
- Traffic data

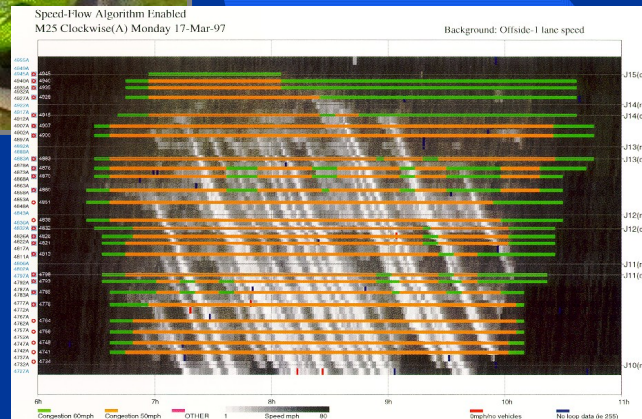


MIDAS Data

- 2 Loops per lane, every 500m
- Queue detection
- Traffic Data
 - ❖ Count (flow) per lane (4 length categories)
 - ❖ Speed
 - ❖ Headway
 - ❖ Occupancy
- Gigabytes of data!
- How to understand?



MIDAS Data and MTV



MTV – Motorway Traffic Viewer

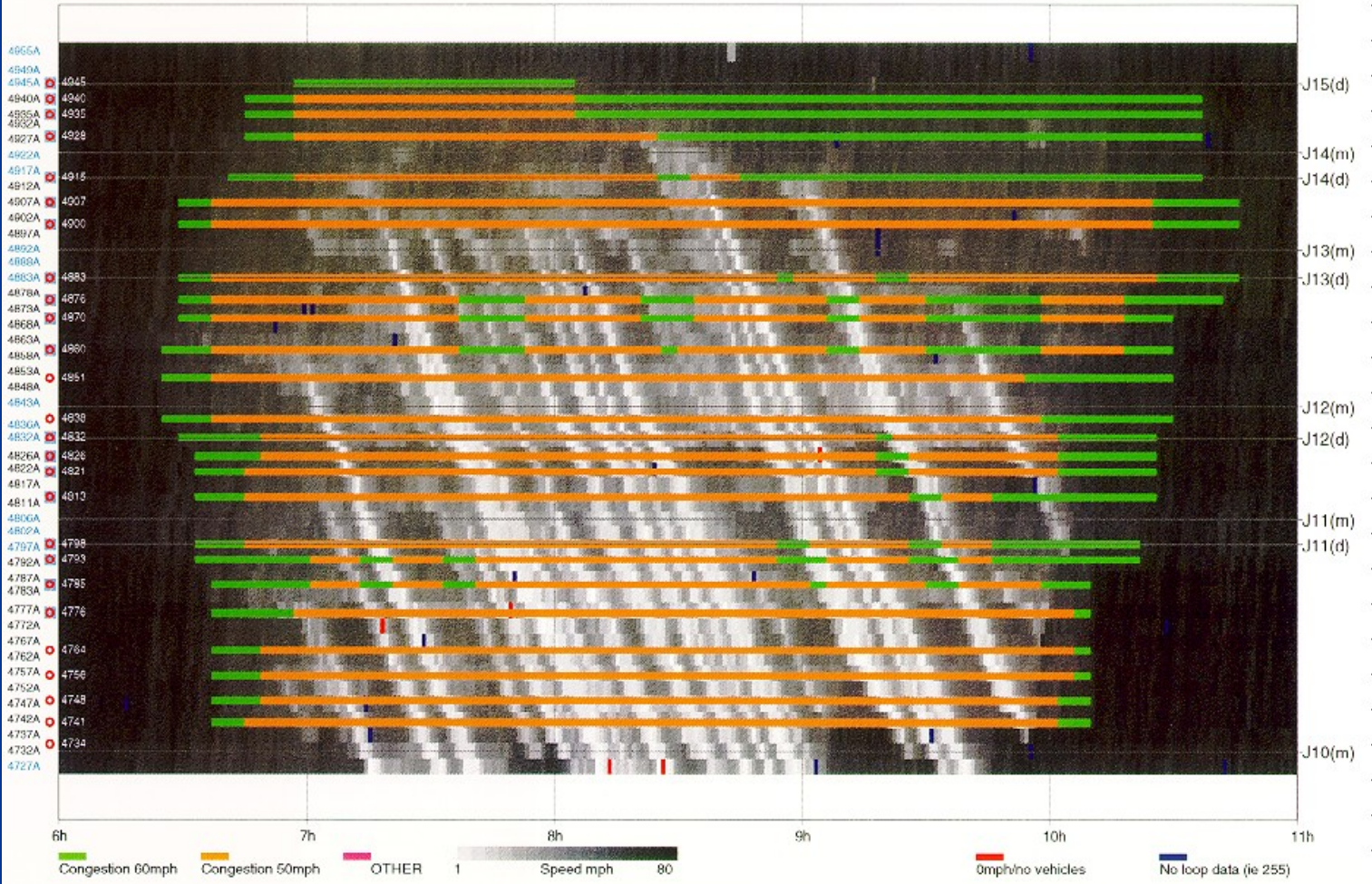
- A tool for viewing traffic data
- Portrays a vast amount of data in an easily readable form
- Many plots to research/understand different aspects of traffic behaviour
- Check the operation of the MIDAS system
- Check the performance of the system
- Identify congestion ‘hotspots’

MTV – Motorway Traffic Viewer



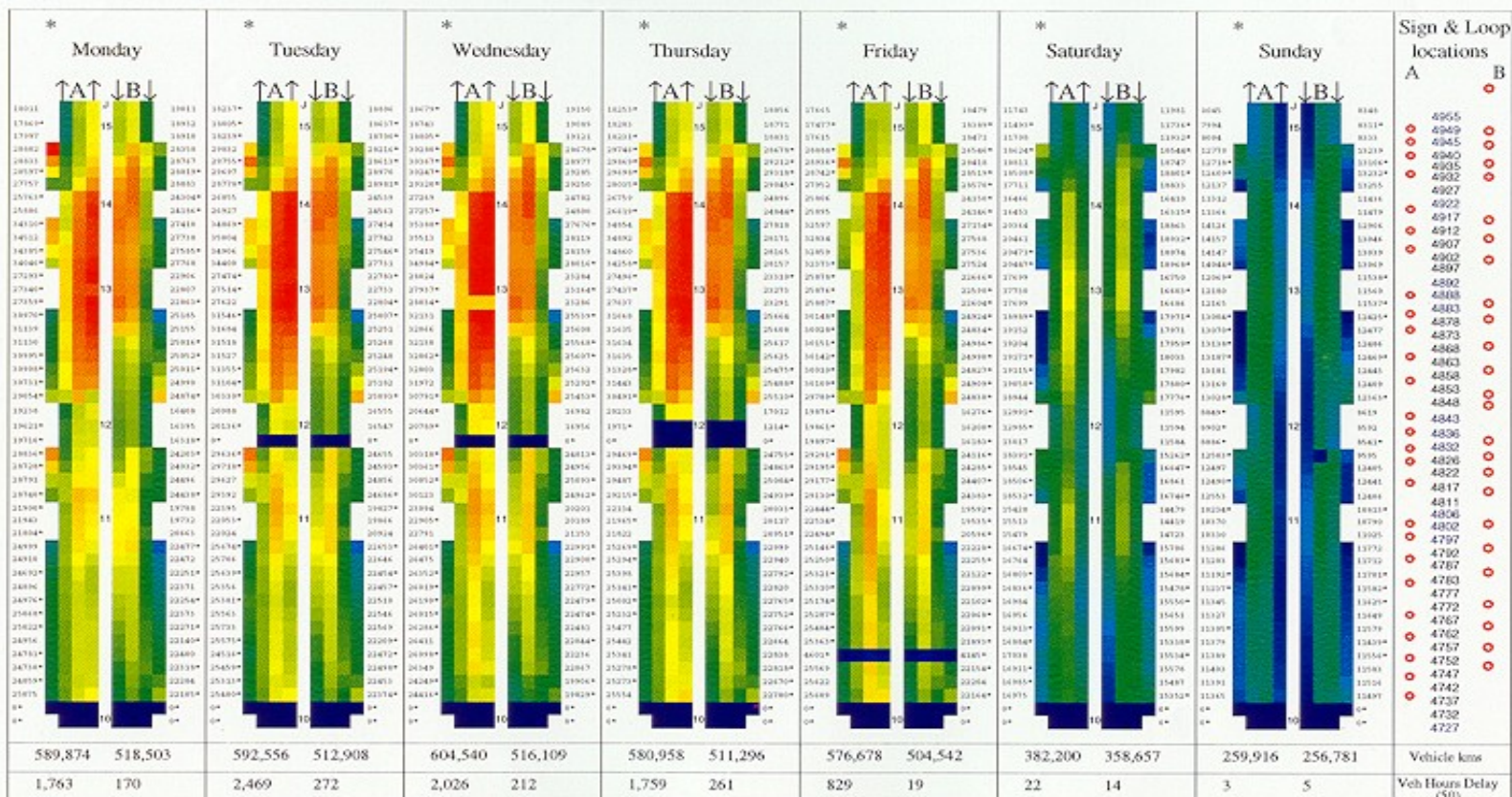
Speed-Flow Algorithm Enabled
M25 Clockwise(A) Monday 17-Mar-97

Background: Offside-1 lane speed



M25 'Hot Spots' Plot (Star Trek)

Figure D7 - Weekly Lane Flow Plot (Mar-96)
M25 Traffic Counts and Summary Statistics 6:00hr to 11:00hr



Total A (clockwise) Vehicle kilometers = 3,586,723 Total B (anti-clockwise) Vehicle kilometers = 3,178,797
 Total A (clockwise) Vehicle Hours Delay(50) = 8,871 Total B (anti-clockwise) Vehicle Hours Delay(50) = 952

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000 Vehicles during 5hr period

Driver Assessment

- Drivers like it!
- More comfortable (less tailgating?)
- More even headways
- Less lane changing/better lane use
- Perception of shorter journey times
- **Perceived benefits are greater than actual benefits!**

M25 J10-16 – Initial results ('03)

- Takes time for drivers to trust system
 - >2 years
- Peak throughput reduced slightly
- Less flow breakdown
- Fewer shockwaves, smoother journeys
- More reliable journey times
- Fewer incidents to clear up

M25 Controlled Motorway Results

- Safety improved by at least 10% (95% confidence level), probably around 15%
- Total Killed or Seriously Injured reduction of around 25-30%

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Discussion