The Mouchel journey of Managed Motorways

Delivering Operational Benefits to road users through the introduction of innovative technology solutions

By Cameron Sweet, Mouchel
Introduction

- Context and the ‘need’ for operational and technical innovation
- The Mouchel Managed Motorways Toolkit
- The ATM and Managed Motorways concept
- The key to success – operations led design process
- Where next in Managed Motorways innovations
<table>
<thead>
<tr>
<th>Context and ‘need’ for operational and technical innovation</th>
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<tr>
<td>• Strategic trunk network traffic growing</td>
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<td>• Traffic flow breakdown usually resulting from erratic driver behaviour</td>
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<td>• Many freeways/highways have unused capacity in the hard shoulder</td>
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<td>• Attributes that result in the need for improvements:</td>
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<tr>
<td>➢ Regular congestion</td>
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<td>➢ Insufficient capacity (today or near future)</td>
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<td>➢ Poor journey times and / or journey time reliability</td>
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<td>➢ Poor safety record</td>
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<td>• Increasing government focus on making ‘best use’ of existing roads in a sustainable, environmentally sensitive, affordable and timely</td>
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The Mouchel Managed Motorways Toolkit

Queue Protection: Automatic protection of incidents and queues

- **Lane Specific Signalling**: Protection of incidents and on-road resources

Ramp Metering: Controlling traffic entering the main carriageway from slip-roads

- **Controlled Motorways**: The dynamic management of traffic Variable Mandatory Speed Limits (VMSL)

- **Hard Shoulder Running**: Controlled use of the Hard Shoulder during times of heavy congestion or during incident management

- **Integrated Network Management**: Management of traffic on the motorway and local road network

- **Prioritised lanes**: Where certain road user groups are provided with dedicated lanes for travel.
<table>
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<tr>
<th>CCTV camera</th>
<th>Lighting Columns</th>
<th>MS4 driver Information panel</th>
<th>Fixed direction signing</th>
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<td>CEC cabinet</td>
<td>Emergency Roadside Telephone</td>
<td>Emergency Refuge areas</td>
<td>Hard Shoulder running</td>
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<tr>
<td>Emergency Refuge areas</td>
<td>Lightweight Gantries</td>
<td>MIDAS</td>
<td>Lane specific signals</td>
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The journey so far...

- **Controlled Motorways (M25):**
  - c1000m gantries with lane based signalling
  - 500m MIDAS
  - Speed / flow algorithms
  - Driver information - 2x12 text messages

- **Active Traffic Management (M42 J3A to 7):**
  - c500m gantries with lane based signalling
  - 100m MIDAS
  - Speed / flow algorithms
  - Use of HS as running lane
  - Driver information - latest message signs
  - Enhanced surveillance using CCTV
• Developed the design principles applied to ATM Pilot and challenged the principles in light of increased operational experience from CM, ATM Pilot and Widening schemes

• Aim to maintain the same level of operational performance and safety as Pilot
  - Spacing of gantries - c800m gantries with MIDAS c400m
  - Inter-visibility
  - Through Junction Running
  - 60mph running (first trailed operationally on Pilot scheme)
  - Viaduct specific operation
  - Retention of existing lighting and other equipment where practical/necessary
The ATM and Managed Motorways concept

- **Operations led process**
  - Focused on identifying the problems to be solved
  - To achieve increased capacity within existing road space
  - Build the solutions within the given the constraints
  - Innovation, technology, scalability

- **Stakeholder Management**
  - Maintainers, emergency services and general public
  - Traffic officer and control room training

- **Design for maintenance**
  - Improving network availability and road worker safety

- **Challenge the standards**
  - Bespoke guidance produced, becoming part of national consideration

- **Robust risk analysis and safety case**
  - Ensuring any risks introduced by schemes are adequately mitigated
Operations led process

- Analysis of Traffic flows & other traffic data
- Junction / Carriageway layouts
- Local Businesses (i.e. supermarkets)
- Future development plans (airports, business parks etc.)
- Carriageway capacity (15 years +)
- Local specific issues – weaving etc.
- How operated – control centre
- Existing infrastructure / communications / technology provision and limitations this may have on design options
- Environmental constraints
- Accidents statistics/hot spots
- Frequency of adverse weather conditions – e.g. high winds

What you have (existing)  →  What you need (objective)  →  Options Report (how do you get there!)
Stakeholder management

• Liaison options:
  - Inform the stakeholders
  - Inform the stakeholders and ask their opinions
  - Inform the stakeholders, ask their opinions and provide feedback
  - Include the stakeholders in your design process – regular review and feedback
Design for Maintenance

- Whole life design
- Design for operations
- BS / CDM (or equivalent)
- Road worker and road user safety is paramount

Design Options

Scenario 1: Initial and Through life Capital Expenditure

Scenario ‘n’: Initial and Through life Capital Expenditure

Final Whole Life Design
Challenge the standards

- **Existing Standards:**
  - Standards are set for almost all aspects of highways design.
  - Provide robust guidance to allow schemes to be implemented quickly with controlled risk

- **However:**
  - Highways have developed over tens of years and many designs are now almost 50 years old!
  - Standards have changed but existing infrastructure often has not.
  - Standards should be respected but should also be challenged
    - Suitable mitigation
    - Robust analysis / safety case
Robust risk analysis and safety case

• Set Safety baseline
• Assess schemes as a whole as to introduction of risk
• Ensure capability to assess the risk impact of individual changes within a scheme
• Use all information available – ensuring best practice
• Authorisation of Safety Case by appropriate party
Key Operational Parameters

• Journey Time Reliability
  ➢ Reliable day in day out – even if some JTs increase by small percentage
  ➢ Frequency of flow breakdown vastly reduced
  ➢ Hard shoulder running at 60mph has maximised benefits

• Increased Capacity
  ➢ Increased capacity results in improved journey time reliability and throughput
  ➢ Speed and lane control increases potential capacity by safely reducing headways
  ➢ The distribution of traffic more even between lanes

• Safety
  ➢ Smoother traffic flows with far fewer severe breaking incidents
  ➢ Movement of traffic consistent between lanes, fewer weaving incidents
  ➢ M42 Pilot scheme has become amongst the safest motorways in Europe

• Compliance
  ➢ Clear and unambiguous signing to promote compliant driver behaviour
  ➢ Provides a highly controlled environment
  ➢ Inter-visibility of the signs and signals assists compliance
  ➢ Average speed or Spot speed enforcement

• Environmental benefits
  ➢ Small reductions in pollutants and noise despite increased throughput
Where do we go from here?

- UK MM schemes successful in reducing congestion, improving predictability of journey times and increasing motorway capacity
- Interactive nature of speed limits along with inter-visibility results in compliant driver behaviour
- Successfully challenged standards
- Operations-led, technology enabled is key to success
- Opportunities for joined up network
- Challenges remain as every road is different
- Managed Motorways concept is key to managing our network and maximising use of existing road space
- Managed Motorways Light…?
- GRIP(s)…?
Managed Motorways Light (M3/M4 concepts)...

- **Advantages:**
  - Far less infrastructure
  - Less capital equipment costs
  - Less construction costs
  - Less environmental impact in both materials and power usage
  - Less visual impact
  - Less maintenance

- **Disadvantages**
  - Untested operational regime
  - Dependent upon the use of average speed cameras, which are not yet proven for use with VMSL, for high compliance. Otherwise...
    - Compliance may not be maintained to previous levels
  - Resulting in performance of operational regime in terms of traffic improvements and safety maybe compromised
Graphical Route Information Panels (GRIP(s))

- Implementation of real time seamless traffic information at critical parts of the road network
- Part of European harmonisation initiative – removing language from the information delivery process
- Accurate real-time data fundamental to successful operation

Schematic GRIP representing an approach to the Birmingham Box from the M40 northbound
Supporting you in changing the way you operate your network

Thank you for listening and

Any Questions