Recommendations Summary

Term Commission for the Maintenance and Enhancement of the Transport Model for Scotland

Report for Transport Scotland

In Association With David Simmonds Consultancy

April 2007

Transport Model for Scotland

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Contents

Contents

Tables

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1 Introduction

1.1 Overview

1.1.1 This report summarises the recommendations for the enhancements to be made to the Transport Model for Scotland (TMfS) over the duration of the new three year term commission.

1.1.2 The Draft TMfS Enhancement Report was delivered to Transport Scotland in January 2007 and included numerous technical and 'soft' recommendations concerning model and user engagement enhancements, which had initially been proposed in our Inception Report, and a range of additional recommendations relating to a number of issues, such as general data collection.

1.1.3 This document provides a summary of those recommendations.

1.1.4 **Tables 1.1 to 1.4** summarise the recommendations for each relevant chapter of the main Enhancement Report, including where relevant, cross-references to the relevant sections of the earlier Project Brief and/or Inception Report, as follows:

- **Table 1.1** provides an overview of 'Model Maintenance, Performance Evaluation and Customer Engagement' recommendations (labelled **'UE'** for 'user engagement);

- **Table 1.2** provides an overview of 'Consultation and Review' recommendations (labelled **'CR'**);

- **Table 1.3** provides an overview of 'Data Overview and Requirements' recommendations (labelled **'D'**); and

- **Table 1.4** provides an overview of 'Proposed Model Enhancement' recommendations (labelled **'E'**).

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**Table 1.1: 'Model Maintenance, Performance Evaluation and Customer Engagement'
Recommendations**

Recommendation	Topic
UE1	Maintaining the TMfS Model Request Form
UE2	Protocol for the Use of TMfS Report
UE3	Maintaining the TMfS User Satisfaction Survey Form
UE4	User Satisfaction Survey Reports
UE5	Training Feedback
UE6	MVA User Liaison
UE7	Organising and Attending Meetings with Users where Appropriate
UE8	User Group Day Programme
UE9	9 November User Group Day Exit Questionnaires
UE10	User Engagement Initiatives
UE11	Non-technical Guide to TMfS
UE12	TMfS Newsletters
UE13	User Group Updates
UE14	Conferences
UE15	TMfS Website

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Table 1.2: 'Consultation and Review' Recommendations

Recommendation	Topic
CR1	Organising and Attending Meetings with Users where Appropriate
CR2	Air and Ferries Meeting
CR3	TMfS User Group Days
CR4	SRTDb Meetings
CR5	HITRANS Meeting
CR6	Software Developers Meeting
CR7	Ayrshire Meeting
CR8	Transport Scotland Rail Division Meeting
CR9	SPT Meeting
CR10	Additional Meetings

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Table 1.3: 'Data Overview and Requirements' Recommendations

Recommendation	Topic
D1	Census Travel-to-Work Data
D2	Scottish Household Survey Data
D3	National/Regional Economic and Geo-Demographic Assumptions
D4	Planning Data Forecasts
D5	In-Vehicle Mobile Phone Tracking
D6	HITRANS RSI Data
D7	A9 Study
D8	SPT Survey Data
D9	Freight Only RSIs
D10	Road Network
D11	Public Transport Service Data
D12	Automated Transfer of Traffic Count Data between SRTDb and TMfS
D13	SRTDb section of Transport Scotland Website
D14	Use of Local Traffic Count Data
D15	Ferry Data
D16	Air Data
D17	Concessionary Travel Database
D18	Weekend Public Transport Patronage Data
D19	Rail 'Load Weighing' Data
D20	SPT Count Data
D21	SRTDb Travel Time Surveys
D22	Inverness Model(s)
D23	Elgin/Moray Model
D24	Kilmarnock VISSIM Model

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D25	Irvine Bay Model
D26	Edinburgh VISUM Model
D27	Network Rail Modelling Framework
D28	National Rail Travel Survey
D29	RailSys Model of Scotland
D30	Stirling Paramics Model
D31	Dundee Microsimulation Models
D32	Clydebank Transport Study
D33	Dumbarton Traffic Model
D34	Glasgow City Centre VISSIM Modelling
D35	Glasgow City Centre Car Parking Requirement Study
D36	Oban Traffic Model
D37	SITM and SITLUM
D38	M8 Bus Priority
D39	Aberdeen Sub-Area Model 3B
D40	'Gap Analysis'

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Table 1.4: 'Proposed Model Enhancements' Recommendations

Recommendation	Topic
E1	General Approach
E2	Use of Alternative Modelling Platform
E3	Extension of the Geographical Coverage of TMfS
E4	Enhanced Use of Existing or New Data
E5	Enhancements to the Current TELMoS Model
E6	Wider Economic Benefits Modelling
E7	Wider Economic Benefits Modelling
E8	Planning and Development Database
E9	Land-Use Model Release Version
E10	Weekend Modelling
E11	Walking and Cycling
E12	Concessionary Travel
E13	Concessionary Travel
E14	Concessionary Travel
E15	Testing the Effects of Integrated Ticketing
E16	Analysis of Bus Congestion
E17	Automated Use of Public Transport Timetable Data
E18	Multiple Occupancy Vehicle Modelling
E19	Enhanced Modelling of Parking
E20	Enhanced Model Validation
E21	Measures to Bring TMfS to a Wider Audience
E22	Accessibility Related Enhancements
E23	Sub-Area Models
E24	Automatic Links to Microsimulation Models

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E25	Environmental Related Outputs
E26	Geo-rectification of the Road Network
E27	User Friendliness
E28	Reducing Run Times
E29	Maintaining Consistency with other Modelling Platforms
E30	Risk/Uncertainty Assessment
E31	Modelling the Impacts of Soft Measures
E32	Incorporating New Government Requirements

1.1.5   The summary recommendation for each item is preceded by references to the Project Brief, Inception Report and the Enhancement Report.

1.1.6   The summary recommendations are followed, where appropriate, by a brief statement of 'Advantages' and 'Disadvantages' as well as any issues surrounding the implementability of the enhancements, including their cost and an indicative priority rating (where relevant).

1.1.7   Transport Scotland has accepted all of the proposed enhancements in principle. However, it should be stressed that implementation of these will be influenced by budget and data availability considerations, with those deemed highest priority by Transport Scotland being implemented first.

1.1.8   Recommendation summaries in this report are provided using the same chapter structure as those in the Enhancement Report in order to ensure ease of reference. To this end, this summary contains the following chapters:

- **Chapter 2:** Model Maintenance, Performance Evaluation and Customer Engagement Recommendations;

- **Chapter 3:** Consultation and Review Recommendations;

- **Chapter 4:** Data Requirement Recommendations (including recommendations from **Appendices I and J**); and

- **Chapter 5:** Proposed Model Enhancement Recommendations.

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2 Model Maintenance, Performance Evaluation and Customer Engagement

2.1 Summary of Recommendations

2.1.1 Recommendations grouped under this chapter heading are labelled 'UE' (User Engagement) and numbered sequentially, based on the order in which they appeared in the main Enhancement Report.

■ Maintaining the TMfS Model Request Form	
Brief:	Section 6.1.1
Inception Report:	Section 8.2
Enhancement Report:	Section 2.6.3
Recommendation UE1:	We strongly recommend that the TMfS Model Request Form is maintained and updated in line with model application experience.
Advantages:	The provision of a strong audit trail and the protection of the integrity of TMfS and Transport Scotland's investment.
Disadvantages:	None.
Implementation:	Negligible cost and high priority task.

■ Protocol Report	
Brief:	Section 2.1.11
Inception Report:	Section 8.1.6
Enhancement Report:	Section 2.3
Recommendation UE2:	We recommend the Preparation of a 'Protocol for the Use of TMfS Report'.
Advantages:	Users will attain a better understanding of the procedures involved in the use of TMfS and the support services available to them.
Disadvantages:	None.
Implementation:	This is a high priority enhancement, which will require initial low investment costs and small maintenance costs thereafter.

■ Maintaining the TMfS User Satisfaction Form	
Brief:	Sections 2.1.13 and 6.1.1
Inception Report:	Section 8.3
Enhancement Report:	Section 2.6.3
Recommendation UE3:	We strongly recommend that the TMfS User Satisfaction Form is maintained and updated in line with model application experience.

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Advantages:	The form will continue to be reflective of model user views.
Disadvantages:	None.
Implementation:	Very low cost and high priority task.

■   Report on TMfS User Satisfaction Survey Results

Brief:	Section 2.1.13 and 6.1.1
Inception Report:	Section 8.3
Enhancement Report:	Section 2.6.3
Recommendation UE4:	We recommend that annual or bi-annual reports on user satisfaction with TMfS, MVA and Transport Scotland are prepared.
Advantages:	The provision of such a report will provide a clear audit of the performance of TMfS as a model and of each of the aforementioned parties associated with TMfS. In addition, such a report will identify areas of strong performance that can be replicated and areas of weaker performance that could be improved.
Disadvantages:	None.
Implementation:	This task would involve a small annual or bi-annual cost and is a high priority enhancement.

■   Training Feedback

Brief:	Sections 2.1.13 and 6.1.1
Inception Report:	Appendix C, Section 9.20
Enhancement Report:	Section 2.4.7
Recommendation UE5:	We recommend that users are provided with a TMfS Training Feedback Form.
Advantages:	Feedback will be used to improve the level and focus of TMfS training.
Disadvantages:	None.
Implementation:	This is a low cost and medium priority enhancement.

■   MVA User Liaison

Brief:	Sections 5.1.4-5.1.6
Inception Report:	Chapter 8
Enhancement Report:	Section 2.5.2
Recommendation UE6:	We propose to have one member of staff assigned to non-project related day-to-day liaison with the TMfS User Group.

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Advantages:	Users would have a focal point for enquiries and consistent and strong lines of communication between MVA and users would be established.
Disadvantages:	None.
Implementation:	Ongoing enhancement with costs dependent on level of support provided. This is a high priority enhancement.

■   Organising and Attending Meetings with Users where Appropriate

Brief:	Sections 5.1.4-5.1.6
Inception Report:	Various
Enhancement Report:	Section 2.6.3
Recommendation UE7:	We propose to organise and attend meetings with TMfS users for data collection purposes, ensuring consistency with other modelling platforms and to address concerns with specific model applications.
Advantages:	Enhanced user engagement, increased data availability and the maintenance of consistency between TMfS and other modelling platforms.
Disadvantages:	None.
Implementation:	Cost is dependent on the number of meetings required, although we believe that this is a high priority enhancement.

■   User Group Day Programme

Brief:	Sections 5.1.4-5.1.6
Inception Report:	Appendix C, Section 9.20
Enhancement Report:	Sections 2.5.9-2.5.13

■   **Recommendation UE8:** The User Group Day on 9 November 2006 was attended by Transport Scotland, the TMfS Support Team, Local Authorities, RTPs, consultants and other interested parties. The day was essentially a high-level overview of the model, with introductions to the aims and objectives of the commission, the STPR and the TMfS Audit. A similar event was held in March 2007 to present and discuss the enhancement package agreed by the TMfS Steering Group.

Advantages:	Close involvement with the User Group allowing MVA and Transport Scotland to hear the views of current TMfS users and encourage use of the model amongst potential users.
Disadvantages:	None.
Implementation:	This is a high priority enhancement with periodic costs for holding User Group Days.

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■   9 November User Group Day Exit Questionnaires

Brief: Sections 2.1.13, 5.1.4-5.1.6 and 6.1.1

Inception Report: Appendix C, Section 9.20

Enhancement Report: Section 2.62

■   Recommendation UE9:   We recommend that user comments from the User Group Day Exit Questionnaires are actioned where appropriate.

Advantages: Greater involvement with the TMfS User Group while responsiveness to the needs of users would ensure the continued relevance of TMfS.

Disadvantages: None.

Implementation: This is a low cost and high priority task.

■   User Engagement Initiatives

Brief: 5.1.4-5.1.6

Inception Report: Appendix C, Section 9.20

Enhancement Report: Section 2.6.2

Recommendation UE10: We propose to scope out a number of initiatives for engaging with the TMfS User Group.

Advantages: Enhanced involvement with the User Group and potential users of TMfS.

Disadvantages: None.

Implementation: This is a low/medium cost and high priority enhancement.

■   Non-Technical Guide to TMfS

Brief: Section 2.1.11

Inception Report: Appendix C, section 9.20

Enhancement Report: Section 2.6.2

Recommendation UE11: We recommend the creation of a non-technical guide for the use of TMfS. We propose to make this note available on the TMfS website.

Advantages: A non-technical guidance note would provide users outside the modelling fraternity with a better understanding of TMfS, allowing them to more fully appreciate the appropriateness of TMfS for their application before applying for use of the model. In addition, such a note would assist in marginally reducing the training provision requirements of the TMfS Support Team.

Disadvantages: None.

Implementation: This task involves an initial low cost and is a high priority enhancement.

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■   **TMfS Newsletters**

Brief: Sections 2.1.11 and 5.1.4-5.1.6

Inception Report: Appendix C, Section 9.20

Enhancement Report   Section 2.6.2

Recommendation UE12: We recommend the provision of technical and non-technical TMfS newsletters at an interval specified by the TMfS Steering Group.

Advantages: Newsletters would allow us to keep the User Group abreast of model developments and would provide an opportunity to engage with members who are not currently using the model.

Disadvantages: None.

Implementation: This task involves an ongoing low cost and is a medium priority enhancement.

■   **User Group Updates**

Brief: Sections 5.1.4-5.1.6

Inception Report: Appendix C, Section 9.20

Enhancement Report: Section 2.6.3

Recommendation UE13: We propose to provide the User Group with updates on the progress of the TMfS enhancements by e-mail and TMfS website announcements.

Advantages: Ensures that the User Group are kept informed of the progress of the TMfS enhancements outwith formal User Group Days.

Disadvantages: None.

Implementation: This is a very low cost and high priority task.

■   **Conferences**

Brief: Section 2.1.11

Inception Report: Appendix C, Section 9.1

Enhancement Report: Section 2.6.3

Recommendation UE14: Opportunities should be sought to present TMfS at relevant conferences worldwide.

Advantages: Enhanced awareness of TMfS and the techniques involved in its development.

Disadvantages: None.

Implementation: This is an ongoing task of medium priority and costs depend on the number of conferences attended.

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■	**TMfS Website**

Brief: Section 6.1.1

Inception Report: Appendix C, Section 9.20

Enhancement Report: Section 2.6.2

Recommendation UE15: We recommend that the User Group section on the TMfS Website is regularly refreshed with additional information and literature where required. In addition, we propose to add an online questionnaire for feedback on the website.

Advantages: Provides a cheap and effective interface with the User Group.

Disadvantages: None.

Implementation: This enhancement involves an ongoing low/medium cost but is nonetheless a high priority.

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3   Consultation and Review

3.1   Summary of Recommendations

3.1.1   Recommendations grouped under this chapter heading are labelled 'CR' and numbered sequentially, providing an indication of their order within the Enhancement Report.

■	**Organising and Attending Meetings with Users where Appropriate**

Recommendation CR1:	See Recommendation **UE11**

■	**Air and Ferries Meeting**

Brief:	Sections 2.1.5, 5.1.1, 5.1.4-5.1.6 and 6.1.1
Inception Report:	Appendix C, Section 3.1
Enhancement Report:	Section 3.2
Recommendation CR2:	We recommend the convening of a meeting with the air and ferry operators whose services would be included in TMfS as well as with the Scottish Executive Air and Ferries Divisions. In addition, we propose to collect and analyse Caledonian MacBrayne (CalMac) volumetric data and Air Discount Survey (ADS) data.
Advantages:	Actioning the recommendations outlined above would provide greater clarity on the issues surrounding the inclusion of air and ferries in TMfS.
Disadvantages:	None.
Implementation:	The meetings identified are low cost and high priority.

■	**TMfS User Group Days**

Recommendation CR3:	See Recommendation **UE8**

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■ SRTDb Meetings	
Brief:	Sections 2.1.4, 5.1.1 and 5.1.4-5.1.6
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Section 3.4
Recommendation CR4:	MVA should provide an indication of their data collection requirements to SRTDb and a meeting should be arranged between the two parties to coordinate the financial aspects of data collection. In addition, we recommend that we work closely with SRTDb throughout this commission and explore the possibility of incorporating data from new collection technologies into TMfS.
Advantages:	Realisation of synergies between TMfS and SRTDb, cost savings and enhanced model data.
Disadvantages:	None.
Implementation:	Requires close liaison between MVA and SRTDb to minimise costs and should be seen as a high priority enhancement.

■ HITRANS Meeting	
Brief:	Sections 5.1.1, 5.1.4-5.1.6 and 6.1.1
Inception Report:	Appendix C, Section 3.1
Enhancement Report:	Section 3.5
Recommendation CR5:	We recommend a follow-up meeting with the constituent members of the HITRANS partnership and Argyll and Bute Council in order to discuss our proposed approach for the geographical enhancement of TMfS and to obtain relevant 'buy-in' prioritisation. In addition, we propose the preparation of a technical note outlining the functionality of TMfS in the newly modelled areas, while we also recommend that a clear specification of existing and required data is produced.
Advantages:	Actioning the recommendations outlined above would assist in creating a 'way forward' for the geographical extension of TMfS.
Disadvantages:	None.
Implementation:	The recommendations outlined above are relatively low cost and high priority.

■ Software Developers Meeting	
Recommendation CR6:	See Recommendation **E2**

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■	**Ayrshire Meeting**

Brief: Sections 5.1.1, 5.1.4-5.1.6 and 6.1.1

Inception Report: Appendix C, Section 9.25

Enhancement Report: Section 3.8

Recommendation CR7: We recommend that a further meeting with the relevant parties is held in the Spring of 2007. In addition, we propose the sharing of data as agreed at the initial meeting and believe that it is important that consistency is sought between the Ayrshire models, TMfS and SITM.

Advantages: Actioning the recommendations outlined above will assist in the promotion of consistency between the Ayrshire models, TMfS and SITM and may also reduce the cost of data collection for both parties.

Disadvantages: None.

Implementation: This is a low cost and high priority task.

■	**Transport Scotland Rail Division Meeting**

Brief: Sections 2.1.5, 5.1.1, 5.1.4-5.1.6 and 6.1.1

Inception Report: Appendix C, Section 9.25

Enhancement Report: Section 3.10

Recommendation CR8: We recommend a further meeting with the Transport Scotland Rail Division to scope out data requirements and to ensure consistency between TMfS and rail based models of Scotland.

Advantages: The TMfS Public Transport Model would be developed in line with the requirements of Transport Scotland and would be consistent with other rail based modelling platforms.

Disadvantages: None.

Implementation: This is a low cost and high priority recommendation.

■	**SPT Meeting**

Brief: Sections 5.1.1, 5.1.4-5.1.6 and 6.1.1

Inception Report: Appendix C, Section 9.25

Enhancement Report: Section 3.13

Recommendation CR9: We recommend ongoing liaison between MVA and SPT with regards to maintaining consistency between TMfS and SITM.

Advantages: Consistency between TMfS and SITM.

Disadvantages: None.

Implementation: This is a low cost and high priority task.

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■	**Additional Meetings**

Brief: Sections 5.1.4-5.1.6 and 5.1.1

Inception Report: Various

Enhancement Report: Section 3.17

■   **Recommendation CR10:**   We recommend a series of further meetings to discuss enhancement priorities and data collection needs with a wide range of organisations.

Advantages: Better understanding of enhancement priorities and increased data availability.

Disadvantages: None.

Implementation: This is a low cost and high priority task.

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4 Data Overview and Requirements

4.1 Summary and Recommendations

4.1.1 Recommendations grouped under this chapter heading are labelled 'D' and numbered sequentially, providing an indication of their order within the Enhancement Report. In addition, this chapter includes recommendations from **Appendix I** and **Appendix J** of the main Enhancement Report.

■ Census Travel-to-Work Data

Brief:	Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1
Inception Report:	Appendix C, Various
Enhancement Report:	Section 4.12.1
Recommendation D1:	It is essential that the 2001 Census Travel-to-Work data (by mode) is used as the basis of the commuting pattern, adjusted to take account of post-2001 changes in population and jobs.
Advantages:	A more robust representation of commuting patterns within TMfS.
Disadvantages:	None.
Implementation:	Straightforward.

■ Scottish Household Survey (SHS) Data

Brief:	Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1
Inception Report:	Appendix C, Various
Enhancement Report:	Section 4.12.3
Recommendation D2:	We propose to use the ever-increasing set of SHS data to update the various behavioural parameters within TMfS and to undertake sufficient analysis to detect any statistically-significant regional variations or trends over time in these parameters.
Advantages:	A more robust calculation of behavioural parameters within TMfS.
Disadvantages:	None.
Implementation:	Straightforward.

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	National/Regional Economic and Geo-Demographic Assumptions
Brief:	Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1
Inception Report:	Appendix C, Various
Enhancement Report:	Section 4.13
Recommendation D3:	We recommend that research on household relocation is undertaken, either in Scotland, or as part of a UK-wide study.
Advantages:	TELMoS would be capable of providing a more realistic forecasting of household relocation behaviour.
Disadvantages:	None.
Implementation:	This recommendation requires additional household surveys and would be a high cost, medium priority enhancement.

	Planning Data Forecasts
Brief:	Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1
Inception Report:	Appendix C, Section 5.1
Enhancement Report:	Section 4.14
Recommendation D4:	We recommend that Local Authority planning data is recollected at the end of 2007. These data would be included in TELMoS, which in turn would provide a more robust representation of current land-use and planning assumptions in the enhanced version of TMfS.
Advantages:	Enhanced land-use and planning data included in TELMoS.
Disadvantages:	None.
Implementation:	Dependent on the availability of data and Local Authorities being able to collate these data.

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■	**In-Vehicle Mobile Phone Tracking**
Brief:	Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1
Inception Report:	Appendix C, Various
Enhancement Report:	Section 4.15.2
Recommendation D5:	We recommend that both MVA and Transport Scotland keep abreast of the development of this technology as it may become a key data source in the future.
Advantages:	Providing this source develops as expected, it would be a highly valuable source of OD movements. These data are also likely to provide partial data on road freight OD movements.
Disadvantages:	None.
Implementation:	This source lies beyond the time horizons of this commission, although MVA and Transport Scotland should keep abreast of developments in the quality of this source for potential future inclusion in TMfS.

■	**HITRANS RSI Data and A9 Study**
Brief:	Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1
Inception Report:	Appendix C, Section 3.1
Enhancement Report:	Section 4.15.3
Recommendation D6:	We have a shortage of origin-destination data for the Highlands. However, the provision of such data is critical in any extension of TMfS to this area. We strongly recommend that the A82 and A96 RSIs are included in the model as part of the enhancement programme.
Recommendation D7:	The A9 RSI(s) should be collected as soon as they are available, as they will provide a 'Trunk Road traffic cordon' around the south and east of Inverness, when combined with the A82 and A96 RSIs.
Advantages:	Enhanced model calibration in the Highlands.
Disadvantages:	None.
Implementation:	Straightforward. We also already possess the data required for **Recommendation D6** and would hope to attain the data required for **D7** in the near future.

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■	SPT Survey Data

Brief:	Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1
Inception Report:	Appendix C, Various
Enhancement Report:	Section 4.15.4
Recommendation D8:	We strongly recommend the inclusion of the bus and rail orgin-destination surveys in the TMfS Public Transport Model.
Advantages:	Enhanced calibration and validation of the TMfS Public Transport Model.
Disadvantages:	None.
Implementation:	Straightforward.

■	Freight Only RSIs

Brief:	Sections 2.1.4, 2.1.6, 2.1.10, 5.1.1 and 6.1.1
Inception Report:	Appendix C, Various
Enhancement Report:	Section 4.15.7
Recommendation D9:	We recommend that a number of freight only RSIs are undertaken.
Advantages:	These RSIs would enhance the reputation of road freight in TMfS and would also be cheaper to conduct than 'all user-class RSIs'.
Disadvantages:	None.
Implementation:	Straightforward.

■	Road Network

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Various
Enhancement Report	Section 4.16
Recommendation D10:	We recommend an ongoing programme of enhancements to the road network, which would be facilitated by electronic datasets as they become available. This recommendation is in addition to the geographical enhancement of TMfS to include previously non-modelled areas.
Advantages:	Improved quality of model data and a more robust representation of the road network, allowing for better calibration of traffic flows.
Disadvantages:	The addition of network detail must be commensurate with TMfS's role as a national strategic model.
Implementation:	Straightforward.

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■	**Public Transport Service Data**

Brief:	Sections 2.1.4-2.1.6 and 6.1.1
Inception Report:	Appendix C, Various
Enhancement Report:	Section 4.17
Recommendation D11:	We recommend the inclusion of local bus service details in smaller cities and key towns, particularly if the process of linking electronic timetable and bus-stop data to the model network can be automated within the new software platform.
Advantages:	Better representation of bus services outwith the Edinburgh-Glasgow-Stirling triangle.
Disadvantages:	None.
Implementation:	Public Transport coding would be straightforward but would be made significantly less labour intensive if potential automation of bus service data is automated.

■	**Automated Transfer of Traffic Count Data between SRTDb and TMfS**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Section 4.18.1
Recommendation D12:	A concerted effort should be made to ensure compatibility between the TMfS and SRTDb representation of the road network. This would facilitate the exchange of traffic flow estimates and could potentially provide an interface between historic SRTDb data and TMfS forecast data.
Advantages:	The standardisation of networks between TMfS and SRTDb would provide a consistent interface for the exchange of count data, while the establishment of a time series database would provide more robust count data for model calibration.
Disadvantages:	None.
Implementation;	Potentially difficult due to the issues involved with providing a 'standard' network.

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■	**SRTDb Section of Transport Scotland Website**

Brief: Sections 2.1.4, 2.1.6 and 6.1.1

Inception Report: Post-Inception Report

Enhancement Report: Section 4.18.2

Recommendation D13:   The creation of a new SRTDb section on the Transport Scotland website would allow for easy access to historic SRTDb traffic data. We recommend that such a facility is also linked to the TMfS Website.

Advantages: Improved access to SRTDb data.

Disadvantages: None.

Implementation: Straightforward.

■	**Use of Local Traffic Count Data**

Brief: Sections 2.1.4, 2.1.6 and 6.1.1

Inception Report: Appendix C, Section 4.1

Enhancement Report: Section 4.18.4

Recommendation D14:   We recommend that we make the maximum use of all available robust traffic count and journey time survey data, particularly in areas where the model validation is currently weaker.

Advantages: Enhanced model validation.

Disadvantages: None.

Implementation: Straightforward.

■	**Ferry Data**

Brief: Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1

Inception Report: Appendix C, Section 3.1

Enhancement Report: Section 4.18.10

Recommendation D15:   Should the TMfS Steering Group support the inclusion of ferry services in TMfS, we recommend the collection and analysis of existing ferry data, allowing us to assess its quality and identify any data gaps. We also propose to hold additional meetings with relevant ferry operators, Transport Scotland and the relevant Local Authorities in order to explore the extent of commercial confidentiality and identify further data sources.

Advantages: The ability to provide a representation of ferry travel within TMfS.

Disadvantages: None.

Implementation: The inclusion of ferry data in TMfS would be technically uncomplicated but there may be issues over poor data quality, data gaps, operator confidentiality and data collection costs.

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■	**Air Data**

Brief:	Sections 2.1.4, 2.1.6, 2.1.10 and 6.1.1
Inception Report:	Appendix C, Section 3.1
Enhancement Report:	Section 4.18.18
Recommendation D16:	We recommend the immediate pursuit of a meeting with the air operating companies to assess their data availability and willingness to provide such data, while we would also reassure operators over the confidentiality of their data. We also recommend the analysis of Air Discount Scheme (ADS) survey data and the investigation into gaps in current data availability. Lastly, we propose to collect aircraft fleet information, which would facilitate the analysis of aircraft emissions information.
Advantages:	The ability to provide a representation of air travel within TMfS.
Disadvantages:	None.
Implementation:	The inclusion of air data in TMfS would be technically uncomplicated but there may be issues over poor data quality, data gaps, operator confidentiality and data collection costs.

■	**Concessionary Travel Database**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Section 4.18.19
Recommendation D17:	We recommend the use of the Concessionary Travel Database to provide data for such travellers.
Advantages:	The ability to provide a representation of concessionary travel within TMfS.
Disadvantages:	Extended model run times.
Implementation:	There are several issues with regards to the inclusion of concessionary travel data in TMfS, as identified in the Enhancement Report.

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■   Weekend Public Transport Patronage Data

Brief:	Sections 2.1.4, 2.1.6, 2.1.8 and 6.1.1
Inception Report:	Appendix C, Section 6.4
Enhancement Report:	Section 4.18.21
Recommendation D18:	We recommend that weekend modelling is not undertaken as there would be significant data collection requirements for a relatively small gain. Should approximation be required to represent weekend travel in specific instances, we would propose to consider alternative approaches as required at the time and using existing data as opposed to collecting new weekend data.
Advantages:	Collection of additional weekend data would provide only negligible Advantages.
Disadvantages:	High cost and low benefits.
Implementation:	Relatively straightforward but high cost.

■   Rail 'Load Weighing' Data

Brief:	Sections 2.1.4-2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Section 4.18.22
Recommendation D19:	We recommend that a sample of these data are obtained and analysed by MVA as they provide a potentially valuable validation source for the rail element of the TMfS Public Transport Model.
Advantages:	Enhanced validation of the patronage element of TMfS rail modelling.
Disadvantages:	None.
Implementation:	Dependent on data quality.

■   SPT Count Data

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Section 4.18.25
Recommendation D20:	We recommend that public transport survey data provided by SPT are included in TMfS.
Advantages:	The inclusion of these data will ensure that the TMfS Public Transport Model is more robust.
Disadvantages:	None.
Implementation:	Straightforward.

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■	**SRTDb Travel Time Surveys**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Section 4.19.1
Recommendation D21:	We recommend that the inclusion of new speed data from the SRTDb Congestion Indicator work in TMfS as this will provide a useful tool for validating model journey times. We propose to collect these data prior to the commencement of the enhancement programme, while we also recommend that further investigation is undertaken to maximise the value of available observed speed and network reliability data.
Advantages:	Enhanced model validation.
Disadvantages:	None.
Implementation:	Straightforward.

4.1.2   The following recommendations were included in Appendix I and related to potential data from donor models.

■	**Inverness Model(s)**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.2
Recommendation D22:	Highland Council's Inverness Area Model(s) would be specifically useful in supporting the geographical enhancement of TMfS, should this enhancement be selected by the TMfS Steering Group. We recommend that data from these models, should they be suitably robust, could be used to enhance TMfS's representation of the Inverness area. Additional information on the specification of these models would be sought following the agreement of the enhancement programme by the TMfS Steering Group.
Advantages:	The model(s) may provide data for the Inverness area, which would support the geographical extension of TMfS.
Disadvantages:	None.
Implementation:	Inclusion should be fairly straightforward, providing data is of an acceptable standard.

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■	**Elgin/Moray Model**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.4
Recommendation D23:	Given the strategic nature of TMfS, it is unlikely that all of the data made available from the above model will be used. Nonetheless, we envisage that we will use the most relevant traffic count, RSI and journey time data. In particular, data collected from key non-Trunk principal roads such as the A941 and A98 are likely to be beneficial to any geographical extension of TMfS. However, other more local data such as data relating to bus services and bus stop information may not be as relevant in the enhancement process. These data are readily available for use in TMfS, subject to the submission of a formal written request to The Moray Council.
Advantages:	The model may provide data for Elgin (and the Moray area in general), which would support the geographical extension of TMfS.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

■	**Kilmarnock VISSIM Model**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Sections 4.1 and 9.25
Enhancement Report:	Appendix I, 1.1.5
Recommendation D24:	Data collected for the Kilmarnock VISSIM model will be available by early 2007. The most beneficial aspect of data collection is the RSI cordon (consisting of eight RSIs) that was developed around Kilmarnock. This will provide origin-destination data which would be useful for looking at wider Ayrshire movements, as well as more local Kilmarnock-based movements. The PT Model could also be supplemented with bus occupancy survey data and origin/destination surveys.
Advantages:	The model would provide RSI, traffic count and public transport survey data for in and around the Kilmarnock area.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

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	Irvine Bay Model
Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Sections 4.1 and 9.25
Enhancement Report:	Appendix I, 1.1.7
Recommendation D25:	The specifications of the Irvine Bay Model are currently being identified and, although not available at present, this model would be beneficial in enhancing TMfS's representation of the economic heart of North Ayrshire. We recommend the collection of these data for assessment once they become available and, should they be suitable, their inclusion in TMfS.
Advantages:	This model could possibly provide RSI, count and public transport survey data for inclusion in TMfS.
Disadvantages:	None.
Implementation:	Dependent on type and quality of data availability.

	Edinburgh VISUM Model – Transport Initiatives Edinburgh
Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.8
Recommendation D26:	The tie VISUM model of Edinburgh that was used in the testing of the Edinburgh Tram project is likely to be highly beneficial to the development of TMfS and would particularly enhance the PT network.
Advantages:	The benefits of this model will become clearer after our forthcoming meeting with tie.
Disadvantages:	None.
Implementation:	Dependent on type and quality of data availability.

	Network Rail Modelling Framework (NRMF)
Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Sections 4.1 and 9.25
Enhancement Report:	Appendix I, 1.1.9
Recommendation D27:	The Network Rail Modelling framework is soon to be available and is being tested by Transport Scotland. We recommend that the model is used to sense-check TMfS's elasticities for rail travel while also improving TMfS's rail demand forecasting.
Advantages:	The NRMF can provide a useful tool for checking TMfS's predicted rail demand elasticities.
Disadvantages:	None.
Implementation:	Straightforward.

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■	**National Rail Travel Survey**
Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Sections 4.1 and 9.25
Enhancement Report:	Appendix I, 1.1.10
Recommendation D28:	The forthcoming National Rail Travel Survey is expected to provide a relatively complete picture of rail movements across the UK. Should these data meet expectations, the NRS is likely to be the principal source of rail origin-destination data and would be expected to replace the dated MOIRA equivalent. We recommend that the data from this survey are obtained and rigorously checked by MVA as a matter of high priority.
Advantages:	The National Rail Travel Survey could provide highly detailed rail origin-destination data for inclusion in TMfS, perhaps replacing ageing MOIRA data.
Disadvantages:	None.
Implementation:	Straightforward, although potentially time consuming.

■	**RailSys Model of Scotland**
Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Sections 4.1 and 9.25
Enhancement Report:	Appendix I, 1.1.11
Recommendation D29:	The RailSys model identified above would provide reliability 'calculators' based on PDFH, allowing for the inclusion of the impacts of rail reliability in TMfS. This would represent a significant step forward in the rail modelling capabilities of TMfS and we recommend that these data should be incorporated into TMfS as part of the rail based enhancements to the model.
Advantages:	This model can provide an estimate of the impact of rail reliability on travel patterns.
Disadvantages:	None.
Implementation:	Straightforward.

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■   **Stirling Paramics Model**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.12
Recommendation D30:	We recommend that the ATC and classified turning counts data available should be included in TMfS, providing that they are of a sufficient standard. We believe that this would enhance the quality of TMfS in the Central Stirling area.
Advantages:	The model could provide various sets of count data for inclusion in TMfS, assisting model validation in the Stirling Council area.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

■   **Dundee Microsimulation Models**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.13
Recommendation D31:	Dundee City Council's microsimulation model data is likely to significantly enhance the representation of traffic data within Dundee. Providing that these data are relevant for inclusion in TMfS, we recommend that they are incorporated into the model.
Advantages:	The models could provide various sets of count data for inclusion in TMfS, assisting model validation in the Dundee area.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

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■   **Clydebank Transport Study**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.14
Recommendation D32:	The Clydebank Transport Study would be able to provide updated RSI information, thus providing travel pattern data, count information and origin/destination information. The journey time data would be advantageous to update previous journey time information present in the area. We recommend that these data should be included in TMfS where appropriate.
Advantages:	This model could provide RSI data for a number of locations in Clydebank. In addition, it could provide count data and bus and car journey time survey data. These would assist model validation.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

■   **Dumbarton Traffic Model**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.15
Recommendation D33:	We recommend that data from the Dumbarton Traffic Model should be used to enhance the quality of TMfS in West Dunbartonshire. In particular, we believe that the inclusion of junction turning count data and available journey time information should also be included in TMfS development.
Advantages:	This model could provide count data and car and bus journey time survey data for Dumbarton, enhancing model validation in that area.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

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■	Glasgow City Centre VISSIM Modelling

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.16
Recommendation D34:	The Glasgow City Centre VISSIM Model would provide a better representation of City Centre traffic conditions, through a combination of junction turning counts and bus and car journey times. As a result, we recommend its inclusion in TMfS where appropriate.
Advantages:	This model could provide count data and car and bus journey time survey data for Glasgow City Centre, enhancing model validation in that area.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

■	Glasgow City Centre Car Parking Requirement Study

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.17
Recommendation D35:	Data obtained from the Glasgow City Centre Parking Requirement Study would enhance the data already used in defining city centre parking charges. In addition, it would also provide a basis for modelling parking in Glasgow should the TMfS Steering Group pursue this enhancement. To this end, we recommend that these data are used to make the necessary updates to TMfS and that further assessment of their use is undertaken if required.
Advantages:	This study could provide details of on and off street parking and estimates of Private Non-Residential (PNR) parking availability, thus enhancing TMfS's modelling of parking in Glasgow City Centre.
Disadvantages:	None.
Implementation:	Straightforward.

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■ **Oban Traffic Model**	

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.18
Recommendation D36:	This model should provide robust traffic and origin/destination data for in and around the Oban area that could be tied into wider improvements in the modelling of traffic in Argyll and Bute within a regional model. Additionally, Oban is arguably the key ferry port in North West Scotland and improved calibration of traffic conditions would also allow a more accurate representation of ferry-bound traffic. We recommend the inclusion of the data from this model.
Advantages:	This model could provide RSI, count and car journey time survey data for Oban. An additional benefit of these data is that they would provide an indication of traffic levels in and around the key North West ferry port of Oban.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

■ **SITM and SITLUM**	

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Sections 4.1 and 9.25
Enhancement Report:	Appendix I, 1.1.19
Recommendation D37:	There has traditionally been a considerable degree of data sharing between TMfS and SITM. We strongly recommend that this relationship continues. TMfS and SITM need to be as consistent as possible and a concerted effort must be made by MVA and SPT to ensure that their data collection programmes are complimentary.
Advantages:	Integration with SITM and SITLUM will significantly enhance the quality of TMfS data in the SPT area.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

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■	M8 Bus Priority
Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix I, 1.1.20
Recommendation D38:	We recommend that these data are considered in any future validation of model enhancements as this would improve the age of data currently used.
Advantages:	This study could provide journey time surveys and volumetric count data for a section of the M8 in the AM peak period, thus enhancing model validation.
Disadvantages:	None.
Implementation:	Inclusion is straightforward providing data is of a sufficient standard.

■	Aberdeen Sub-Area Model (ASAM) 3B
Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Sections 4.1 and 9.25
Enhancement Report:	Appendix I, 1.1.21
Recommendation D39:	Traffic data collected during the original construction of ASAM is already contained in TMfS. We propose that this exchange of data continues and recommend the inclusion of the two recently conducted RSIs and any additional count information that can be obtained from ASAM 3B in TMfS. This would enhance the quality of data already included in TMfS, providing greater model robustness and enhanced representation of traffic patterns in the North East of Scotland.
Advantages:	The inclusion of the Deeside RSIs identified above will provide an enhanced understanding of travel patterns within the Deeside area.
Disadvantages:	None.
Implementation:	Straightforward.

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◼ **Gap Analysis (Appendix J)**

Brief:	Sections 2.1.4, 2.1.6 and 6.1.1
Inception Report:	Appendix C, Section 4.1
Enhancement Report:	Appendix J
Recommendation D40:	Despite the data availability outlined above, there remain a number of gaps in the required data for model development, calibration and validation. To this end, we recommend that the new data collection requirements identified in Appendix J of the Enhancement Report are implemented.
Advantages:	New/better quality data included in TMfS:
Disadvantages:	None.
Implementation:	This is a high cost and high priority recommendation.

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5   Proposed Model Enhancements

5.1   Summary and Recommendations

5.1.1   Recommendations grouped under this chapter heading are labelled 'E' and numbered sequentially, providing an indication of their order within the Enhancement Report.

■ **General Approach**	
Brief:	Section 2.1.9
Inception Report:	Appendix C 2.1
Enhancement Report:	Section 5.2
Recommendation E1:	TMfS should be developed as a hierarchical structure, with a single national model coupled with regional sub-area models for the appraisal of local and regional transport strategies. The national model will have the same overall structure as the current TMfS model, along with some enhancements that are appropriate for a national model. The regional models would have a zone and network structure compatible with the national model but at a greater level of detail. They would also include enhancements which are more suited to regional models and would be implemented in software which has capabilities for more detailed analysis compared with the national model.
Advantages:	There are a number of advantages to this approach. Firstly, the smaller geographic scale of the regional models would result in quicker run times and better convergence levels. In addition, many of the proposed enhancement items would be more appropriately implemented at a spatially detailed level compared with a national model. The hierarchical approach would also be a standard tool and would result in stable scheme appraisals. Lastly, there is a stronger likelihood that Local Authorities and/or Regional Transport Partnerships (RTP) will commit to a degree of ownership and data exchange with a model that better suits there their local/regional requirements, leading to a more robust representation at a regional level.
Disadvantages:	The principal disbenefit of this approach is the data requirements associated with the greater level of spatial detail in the regional models. In addition, procedures would need to be developed to ensure that regional models are always up-to-date and consistent with the national model. Lastly, the availability of sub-area models will create debate about the most appropriate model to use for appraising larger schemes, particularly those with cross-boundary effects and create the risk of having two different estimates of scheme benefits.

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Implementation:	Implementation is potentially complex and definitely less straightforward than the 'modular approach', given the need to develop regional models. The regional model approach is also high cost but is nonetheless high priority.

■   Use of Alternative Modelling Platform

Brief:	Section 2.1.9
Inception Report:	Appendix C 2.1
Enhancement Report:	Section 5.3
Recommendation E2:	We recommend that TMfS migrates to be modelled fully using the CUBE software platform.
Advantages:	Enhanced modelling capabilities and contribution from the software provider in implementing software related enhancements.
Disadvantages:	None.
Implementation:	High cost and high priority. Indeed, the Enhancement Report notes that the migration to CUBE is necessary to efficiently deliver many of the other suggested enhancements.

■   Extension of the Geographical Coverage of TMfS

Brief:	Sections 2.1.5, 2.1.6 and 6.1.1
Inception Report:	Appendix C 3.1
Enhancement Report:	Section 5.4
Recommendation E3:	We recommend that the geographical coverage of the TMfS national model be extended to cover the whole of Scotland. This will require the inclusion of ferries and air travel into the modelled modes and will require the development of a long distance travel model, to ensure fuller coverage of all types of travel within the model.
Advantages:	The largest benefit of this enhancement is that TMfS would be a truly national model for the first time. This would allow for the extension of TMfS's environmental appraisal module (ENEVAL) to provide a national picture of CO_2 emissions as well as a considerably more realistic picture of national transport movements.
Disadvantages:	Increase in run time and methodological difficulties associated with modelling significantly different travel patterns.
Implementation:	High cost and high priority.

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■	Enhanced Use of Existing or New Data
Brief:	Various Sections
Inception Report:	Appendix C 4.1
Enhancement Report:	Section 5.5
Recommendation E4:	We recommend all of the data enhancement tasks outlined in **Table 5.1** of the Enhancement Report (with the exception of Map Mechanics) are implemented.
Advantages:	Enhanced model calibration and validation.
Disadvantages:	None.
Implementation:	Requires investigation of all available data sources although implementation should be relatively straightforward, with costs varying from low to medium and priority from low to high.

■	Enhancements to the Current TELMoS Model
Brief:	Section 6.1.1
Inception Report:	Appendix C 5.1
Enhancement Report:	Section 5.6
Recommendation E5:	The land-use/economic modelling in TELMoS should be enhanced in accordance with the TELMoS proposals explained in Section 5.6 of the Enhancement Report. These are designed to ensure that TELMoS will provide a state-of-the-art means of producing the required "planning data" inputs to TMfS, of assessing the land-use and economic impacts of transport proposals and policies tested in TMfS, and of continuing to provide the best practical model-based information to inform the assessment of Economic and Activity Location Impacts given the requirements (current and expected) of STAG.
Advantages:	Enhanced land-use inputs into TMfS.
Disadvantages:	None.
Implementation:	Costs range from low to medium and priority from low to high. An overview of the implementation characteristics can be found in **Table 5.2** of the Enhancement Report.

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■	**Wider Economic Benefits Modelling**

Brief:	Section 2.1.8
Inception Report:	Appendix C 6.3
Enhancement Report:	Section 5.7
Recommendation E6:	TMfS/TELMoS outputs should be adjusted (and maintained) to enable users to apply the Department for Transport's (DfT) WEB methodology using additional data and sensitivities assembled by DfT or available from other sources.
Recommendation E7:	Further consideration will be given to incorporating the 'more-people-in-work' (MPIW) effect and other impacts within the main TELMoS Model.
Advantages:	TMfS/TELMoS would be able to provide a more accurate representation of the wider economic benefits of transport infrastructure investment and policies.
Disadvantages:	None.
Implementation;	**E6** is a low cost, medium priority recommendation, while **E7** is a medium cost, medium priority recommendation.

■	**Planning and Development Database**

Brief:	Section 6.1.1
Inception Report:	Appendix C 5.7
Enhancement Report:	Section 5.8
Recommendation E8:	The TELMoS Planning and Development database should be formalised as a deliverable dataset with a supporting report at each juncture of APPI data collection and preparation of forecasts.
Advantages:	The provision of a consistent formalised planning and development database.
Disadvantages:	None.
Implementation:	This is a low cost, high priority recommendation.

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■	**Land-Use Model Release Version**

Brief:	Section 6.1.1
Inception Report:	Appendix C 5.9
Enhancement Report:	Section 5.9
Recommendation E9:	The knowledge and awareness of TELMoS amongst model users should be enhanced through User Group Days and the audit process. Further consideration should be given to a release version of TELMoS once the model development is complete.
Advantages:	The processes involved in TELMoS will become more transparent and increase modelling resources if non-DSC users have access to the model.
Disadvantages:	None.
Implementation:	This is a low cost, medium priority enhancement.

■	**Creation of a Model Hierarchy**

Brief:	Section 2.1.1
Inception Report:	Appendix C 6.1
Enhancement Report:	Section 5.10
Recommendation:	This recommendation is addressed by **E1**.

■	**Weekend Model**

Brief:	2.1.8
Inception Report:	Appendix C 6.3
Enhancement Report:	Section 5.11
Recommendation E10:	It is recommended that a weekend travel model is not included in the national TMfS model. Creation of weekend models in the lower tier regional models could be on an 'as required' basis, for the assessment of specific problems and specific locations.
Advantages:	TMfS would be able to analyse weekend travel patterns, with particular emphasis on the so called 'retail peaks'.
Disadvantages:	A significant amount of data collection would be required and the costs would be likely to significantly exceed the benefits.
Implementation:	We do not recommend the implementation of a weekend model given the costs and low benefit stream from such a model.

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■	**Walking and Cycling**

Brief:	Section 6.1.1
Inception Report:	Appendix C 6.5
Enhancement Report:	Section 5.12

Recommendation E11:	Walking and cycling as main modes of travel could be included in regional sub-area models where there are appropriate data to support this. In the national TMfS model, consideration should be given to incorporating walking and cycling as overall volumes of traffic, with magnitude linked to car ownership and the level of trip making by public transport and car.
Advantages:	TMfS would be able to analyse walking and cycling patterns, providing valuable information on trends in the key 'slow modes'. Inclusion of these modes would be beneficial in investigating the impact of 'soft measures'.
Disadvantages:	The modelling of walking and cycling typically requires much-more detailed zoning systems and network detail than are needed for motorised modes. There are also usually less data available about current walking/cycling travel patterns.
Implementation:	The addition of walking and cycling in the national TMfS model is a low cost, medium priority task, although the cost may rise depending on the decision on whether and how to implement the representation of these modes.

■	**Concessionary Travel**

Brief:	Section 6.1.1
Inception Report:	Appendix C 7.3
Enhancement Report:	Section 5.13

Recommendation E12:	We strongly recommend that MVA (or others) assist Transport Scotland to create an accurate matrix of current users of concessionary travel by a) geo-coding the relevant fare-stage information used by the various bus operators and their ticket machines and b) analysing from-home and return-home journey pairs in the smart-card ticket data to produce a reasonable profile of the current pattern of concessionary travel demand (ie boarding and alighting matrices).
Recommendation E13:	We recommend that Transport Scotland commission or undertake further research regarding the use of concessionary travel, as outlined in **Section 5.13.18** of our Enhancement Report.
Recommendation E14:	We recommend that Transport Scotland commission MVA to combine the results of recommendations **E12** and **E13** within the TMfS Demand Model to produce a mechanism capable of predicting a matrix of 'free' public transport users (Concessionary and season ticket holders) that can be assigned separately within the TMfS Public Transport network assignment.

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Advantages:	The above recommendations would provide an indication of concessionary traveller movements and their impact on public transport in Scotland. This is an area that is not currently well understood and further research would be beneficial.
Disadvantages:	Since it effects both the Demand Model and the two types of network assignment, the process of including concessionary travellers in TMfS will add to both the complexity and run-time of the model.
Implementation:	The inclusion of concessionary travel in TMfS would require a significant amount of model development time, plus associated behavioural research and model calibration. **E12** is a medium cost, medium priority recommendation. **E13** is a high cost, medium priority recommendation and **E14** is a high cost, low priority task.

■ **Testing the Effects of Integrated Ticketing**	
Brief:	Section 6.1.1
Inception Report:	Appendix C 7.8
Enhancement Report:	Section 5.14
Recommendation E15:	We recommend that a more sophisticated fares model is developed that more closely reflects actual current public transport fares. This will provide a more suitable starting point for testing alternative fares policies.
Advantages:	TMfS would have the ability to test integrated ticketing and would also have a more robust fares structure in place.
Disadvantages:	A significant amount of data collection would be required.
Implementation:	This is a low cost, medium priority enhancement.

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■	**Analysis of Bus Congestion**

Brief: Sections 2.1.5 and 6.1.1

Inception Report: Appendix C, 7.11

Enhancement Report: Section 5.15

Recommendation E16: We recommend that Transport Scotland and/or the RTPs work closely with bus operators to identify areas where current and future congestion is having the greatest impact on bus journey times and reliability. This analysis will involve a combination of research into bus timetable information, consultation with bus operators and analysis of TMfS forecasts, but does not require any significant enhancement to TMfS functionality.

Advantages: Analysis of bus congestion would provide a more realistic picture of bus journey times that could be fed into TMfS.

Disadvantages: None.

Implementation: This enhancement is a medium cost, medium priority task, although the cost may be reduced with the provision of electronic bus timetable data (Recommendation **E17**).

■	**Automated Use of Public Transport Timetable Data**

Brief: Sections 2.1.5 and 6.1.1

Inception Report: Appendix C 7.12.1

Enhancement Report: Section 5.16

Recommendation E17: MVA should work with the relevant software providers to ensure that the automated interface between timetable data and TMfS's representation of public transport services can be delivered and maintained. We therefore recommend that the necessary interface and associated tools within the relevant software platform are developed, to enable TMfS to cost-effectively maintain an accurate and up-to-date representation of timetable public transport services.

Advantages: A significant amount of both time and money will be saved in terms of maintaining the TMfS Public Transport Model. Additional flexibility in the use of the Public Transport Model will also be provided – eg for modelling other time periods.

Disadvantages: None.

Implementation: The implementation of this enhancement would require some initial investment but the resulting cost savings in maintaining the Public Transport Model means that this is a very low cost improvement, while it should also be considered a high priority enhancement.

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■	**Multiple Occupancy Vehicle Modelling (MOV)**

Brief: Section 6.1.1

Inception Report: Appendix C 8.1

Enhancement Report: Section 5.17

Recommendation E18:	Further testing of the implementation of MOV lanes should be carried out to confirm the sensitivity of the process to changes in travel costs. Where, for some travel movements, MOV lanes only operate in the from-home direction, a methodology should be developed for including estimates of the to-home travel costs in the model.

Advantages: TMfS would have an enhanced capability for MOV modelling.

Disadvantages: None.

Implementation: This is a medium cost task but, given the likely need to test HOV lanes and other priority measures, it is also a high priority task.

■	**Enhanced Modelling of Parking**

Brief: Section 6.1.1

Inception Report: Appendix C 8.3

Enhancement Report: Section 5.18

Recommendation E19:	The inclusion of average parking charges in the current TMfS should be continued in the national model. For sub-area and regional models, a more detailed representation of car parking should be included where there are suitable data available. This should include supply effects such as capacities of individual car parks, differential charges by time period and the congestion effects of searching for a parking place.

Advantages: TMfS would provide a better representation of parking behaviour, particularly for the major urban areas.

Disadvantages: Accurate modelling of car park capacity (and calibration to match current use) will incur additional data collection costs.

Implementation: This is initially a low cost, medium priority task, although the costs may increase depending on the requirements of individual sub-area models.

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■	**Enhanced Model Calibration and Validation**

Brief: 2.1.10

Inception Report: Various

Enhancement Report: 6.12

Recommendation E33: Having completed the data collection tasks identified in **Recommendations D1-D40**, we recommend the calibration and validation of all aspects of the transport and land-use models.

Advantages: Increased confidence in the base model.

Disadvantages: None.

Implementation: This is a high cost and high priority enhancement.

■	**Measures to Bring TMfS to a Wider Audience**

Brief: Sections 5.1.4 and 5.1.5

Inception Report: Appendix C, 9.1

Enhancement Report: Section 5.20

Recommendation E21: This enhancement is widely discussed in **Chapter 2.**

■	**Accessibility Related Enhancements**

Brief: Section 6.1.1

Inception Report: Appendix C, 9.4

Enhancement Report: Section 5.21

Recommendation E22: We recommend that MVA develop additional tools for extracting generalised travel costs (by mode and time period) from each TMfS zone to a set of user-defined destinations and for combining these costs into so-called 'Hansen Indicators' of overall accessibility from each origin.

Advantages: This would add a powerful generic accessibility-related appraisal module to TMfS at very low cost and would also allow relevant outputs from TMfS to be used in subsequent more-detailed accessibility analysis. (Note that this enhancement has already been requested by the STPR team).

Disadvantages: None.

Implementation: This enhancement is low cost and high priority (and is already underway for the STPR project).

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■   Sub-Area Models

Brief: Section 6.1.1

Inception Report: Appendix C, 9.10

Enhancement Report: Section 5.22

Recommendation E23:   We recommend that the TMfS Release Version should include an automated sub-area road assignment procedure and a public transport sub-area process.

Advantages: Users who gain access to TMfS will be able to create their own sub-area models, although under the stipulations of their TMfS Model Request Form.

Disadvantages: None.

Implementation: This enhancement is low cost and low priority.

■   Automatic Links to Microsimulation Models

Brief: Section 6.1.1

Inception Report: Appendix C, 9.12

Enhancement Report: Section 5.23

Recommendation E24:   We believe that both the proposed software platforms will provide semi-automatic links to powerful sub-area microsimulation models. No further action is therefore required at this stage. There will be small amounts of investment to create specific sub-area microsimulation model 'windows' on key locations within the TMfS network. These would/should be developed on a project-by-project basis.

Advantages: Such links would allow for more advanced interaction between TMfS and highly detailed local sub-area models.

Disadvantages: None.

Implementation: No specific action is required for the time being so this is a zero cost recommendation.

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■	**Environmental Related Outputs**

Brief:	Section 2.1.12
Inception Report:	Appendix C, 9.15
Enhancement Report:	Section 5.24

Recommendation E25:	We strongly recommend that ENEVAL is made fully consistent with 'best practice', with an added functionality to offer the alternative and more accurate link and junction traffic emissions calculations. However, we do not propose to add additional functionality at this stage (eg estimations of emissions or noise from other modes (trains/ferries/aircraft) or the addition of dispersal/propagation models) but would continue to review the desirability of such enhancements.

Advantages:	Ensures that TMfS-based environmental outputs remain consistent with recommended 'Best Practice' in the UK.
Disadvantages:	None.
Implementation:	This is a low cost and high priority enhancement.

■	**Geo-rectification of the Road Network**

Brief:	Section 6.1.1
Inception Report:	Appendix C, 9.18
Enhancement Report:	Section 5.25

Recommendation E26:	We recommend that we extend the noise mapping related work being partly undertaken by MVA to provide a fully geo-rectified version of the TMfS road and rail model.

Advantages:	Significant enhancements to the quality of outputs by enabling the relevant flows and vehicle speeds to be output, viewed and analysed directly in GIS-based systems.
Disadvantages:	None.
Implementation:	This is a medium cost and medium priority enhancement.

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■	**User Friendliness**

Brief: Various Sections

Inception Report: Appendix C, 9.20

Enhancement Report: Section 5.26

Recommendation E27:	The current and future 'user friendliness' of the model should be assessed by means of the 'TMfS User Satisfaction Survey', and any problems identified by this should be tackled promptly, thereby allowing us to continually refine the model interfaces, inputs and outputs.

Advantages: Outlined in **Chapter 2.**

Disadvantages: None.

Implementation: Outlined in **Chapter 2.**

■	**Reducing Run Times**

Brief: Section 2.1.9

Inception Report: Appendix C, 9.22

Enhancement Report: Section 5.27

Recommendation E28:	The development of TMfS in the Citilabs CUBE suite will be implemented with improved run times as a key requirement. In addition, testing of the CUBE Cluster system for distributing model processing across multiple PCs should be carried out in order to establish an optimum arrangement for minimising model run times.

Advantages: Reduced run times will allow for a quicker turnaround in TMfS applications, while also reducing costs.

Disadvantages: None.

Implementation: The cost of this enhancement is largely captured under recommendation **E2** and is thus a low cost recommendation. The use of CUBE Cluster will follow the main model development phase and is therefore a low priority.

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■	**Maintaining Consistency with Other Modelling Platforms**

Brief: Section 5.1.6 and 6.1.1

Inception Report: Appendix C, 9.24

Enhancement Report: Section 5.28

Recommendation E29:	TMfS should, as far as possible, be consistent with other modelling platforms.

Advantages: Consistency with other models and data sources will ensure that the development of TMfS is concurrent with that of other relevant modelling platforms.

Disadvantages: None.

Implementation: As noted in **Chapter 2**, this will be an ongoing process, which will be low cost but of a medium priority.

■	**Risk/Uncertainty Assessment**

Brief: Sections 5.1.4-5.1.6 and 6.1.1

Inception Report: Appendix C 9.27

Enhancement Report: Section 5.29

Recommendation E30:	In the case of 'Do Minimum' or 'Reference Case' forecasts, sensitivity tests will be conducted showing the impact of changes in the assumptions relating to economic growth and to assumptions about which schemes are treated as committed in the 'Do Minimum' case. For the testing of schemes, a programme of sensitivity tests on the assumptions (described in the Enhancement Report) will be carried out. This would aid the identification of any assumptions made in addition to those in the 'Do Minimum' to which the model outputs are particularly sensitive.

Advantages: Mitigation of risk and improved identification of the key input assumptions.

Disadvantages: None.

Implementation: This is a low cost, medium priority enhancement.

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■	**Modelling the Impact of Soft Measures**
Brief:	Section 6.1.1
Inception Report:	Appendix C, 10.1
Enhancement Report:	Section 5.30
Recommendation E31:	We recommend that a programme of social research is carried out to establish the potential scale of impacts of a range of soft measures. Based on the analysis of data collected in these studies, a methodology for amending model parameters should be developed so that the impact of soft measures on travel patterns can be assessed.
Advantages:	TMfS would be able to produce some analysis on the impact of increasingly important 'soft measures' on current and future travel patterns. Any research conducted would also generate valuable information for other studies unrelated to TMfS.
Disadvantages:	None.
Implementation:	This is a medium cost and medium priority enhancement.

■	**Incorporating New Government Requirements**
Brief:	Sections 2.1.2 and 6.1.1
Inception Report:	Appendix C, 10.5
Enhancement Report:	Section 5.31
Recommendation E32:	The TMfS Support Team will continue to be responsive to emerging policy requirements and will endeavour to identify resources to include additional model enhancements as required to meet the changing needs of these policy makers.
Advantages:	In adhering to new Government requirements, TMfS will remain concurrent with best practice in multi-modal modelling and will ensure that it meets all legal requirements.
Disadvantages:	None.
Implementation:	The cost of this 'catch-all' enhancement is difficult to predict in advance, but for now has been classified as low cost. It is also a medium priority (but may become more urgent depending on the results of the May 2007 elections).

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