

BUMP – The Birmingham Updated Noise Mapping Project

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Birmingham was the first city in the UK to produce citywide noise maps of the main transportation noise sources. This project was supported by the UK Government's Department of Environment Transport and the Regions and was completed in 2000. The main achievement of this project was to demonstrate that was possible to carry out such an exercise in the UK by employing modern computer-based techniques to produce noise mapping data, subsequently produce data on noise exposure across the City and, thereby, examine the effects on noise exposure of potential noise reduction initiatives. In 2004, with the support and encouragement of central government, it was decided that the Birmingham Updated Noise Mapping Project (BUMP) would be undertaken. This project aims to extend the expertise that the City gained from the original noise mapping project to create a new and integrated environmental noise assessment methodology to aid in the future management of environmental noise in the City of Birmingham. In carrying out the updating project the City shall also attempt to satisfy the technical and reporting requirements of the so-called Environmental Noise Directive for the first round of strategic noise mapping. All EU member states are required to complete such mapping, for major roads, railways and airports and for all agglomerations with more than 250,000 inhabitants, by the middle of 2007. The intention is to complete and report on the BUMP project by April 2006. So the paper that will be presented will in effect be a progress report.

1 Introduction

In 2000 Birmingham City Council (BCC), with the support of the UK Government's Department of the Environment, Transport and the Regions (DETR) and the assistance of consultants, deBakom, produced the first citywide maps in the UK [1]. The main achievement of this exercise was to demonstrate that it was possible to carry out such an exercise in the UK through computer-based modelling and calculation techniques, to subsequently produce noise exposure data and examine the potential effects of various noise reduction and management strategies [2]. In April 2004, BCC, with the support and active participation of the UK Government's Department for Environment, Food and Rural Affairs (Defra) launched the Birmingham Updated Noise Mapping Project (BUMP).

Compared with the previous mapping exercise the new project has a more formal management structure consisting of a Project Team of BCC scientists, a Project Board with representatives of the Project Team and Defra's noise and data advisors and a project Steering Group with representatives of the potential end users of the results of the project including various BCC departments and some external organisations, and also representatives of the main data providers. It should be noted that the Project Team carry out all of the work of the project and that there is no day-to-day involvement of consultants.

2 Objectives of BUMP

It is hoped that through BUMP the expertise that BCC gained from the original noise mapping exercise will be enhanced and extended to create a new and integrated environmental noise assessment methodology to aid the future management of noise in the City. The intention is to complete the project and to prepare a report by April 2006.

A summary of the overall and local project objectives is provided below.

Overall – the results of BUMP shall:

- Satisfy the technical and reporting requirements of the Environmental Noise Directive (END) [3], and;
- Address and resolve data acquisition and data management issues.

Local – the results of BUMP shall:

- Produce updated noise exposure data,
- Identify quiet facades on residential buildings,
- Identify relatively quiet areas,
- Inform the local land use planning system,
- Help develop the Birmingham Unitary Development Plan and the Local Transport Plan,

- Inform the public in Birmingham about the current noise exposure levels across the city,
- Provide tools to develop action plans for the management and reduction, where necessary, of environmental noise, and,
- Provide tools to protect existing relatively quiet areas and create, where necessary, new relatively quiet areas.

3 Progress of BUMP to date (May 2005)

The project commenced at the beginning of April 2004 with a launch meeting, which was attended by representatives of all City departments that were potential end-users of the outputs from the project or suppliers of the input data required to undertake the project. It was also attended by representatives of Defra and Solihull Metropolitan Borough Council (MBC), a neighbouring local authority, which is affected by noise from Birmingham International Airport.

A number of important decisions sprang from that meeting. These were as follows.

The noise sources to be mapped would be:

- Road traffic
- Rail traffic
- Midland Metro (Tram)
- Aircraft

The calculation methods used would be:

- UK - CRTN [4] method for road traffic
- UK - CRN [5] method for rail traffic and Midland Metro
- UK – ANCON 2 [6] [7] method for aircraft

The output of the noise mapping exercise would be:

- L_d , L_e , L_n and L_{den}
- Calculations at 10 x 10m grid points and at building facades, all at a height of 4m.

As a result of the meeting, the Project Board and Steering Group were set up and it was concluded that the Project Team had initially got four tasks to undertake as a matter of urgency.

- To meet with potential end-users of the Project and discuss their needs.
- To hold a 'Data Workshop' to identify potential sources of data that would be needed to undertake BUMP
- To start the lengthy process of acquiring the necessary input data.

- To consider whether to include Solihull MBC in the mapping process. It was subsequently decided that this would be done.

These four tasks have taken up most of the Project Team's resources to date.

3.1 Progress with data acquisition

A summary of the progress with data acquisition to date (May 2005) is as follows:

Road Traffic

For all roads in the mapping area with flows greater than 1000 vehicles per day data has been obtained from the PRISM [8] transport model. This data includes hourly flows categorised by cars, heavy goods vehicles and buses, and corresponding average speeds. All this data is currently under evaluation.

For roads with flows less than 1000 vehicles per day some flow data is available from PRISM but this may have to be supplemented with data that is being obtained from traffic counts carried out by the City's Transportation Department. The speeds on these roads will be assumed to be the speed limit because they are lightly trafficked.

Motorway surface texture data has been obtained from the maintenance contractors.

Topography and Topology

As part of its preparations for noise mapping in the UK, the Government is gathering required topographical and topological datasets and has agreed to supply the BUMP project with this data for the Birmingham and Solihull areas.

This data comprises:

- A ground elevation model
- The location and height of all buildings
- Details of hard and soft ground parcels
- The road network

In addition to this data, details of the height and location of purpose-built noise barriers, which are principally located alongside motorways, has been obtained from the motorway maintenance contractors.

Rail Traffic

Rail traffic data for 2004 has been obtained from databases of rail movements held by contractors on

behalf of Network Rail, the body responsible for the national railway infrastructure.

Passenger train speed data has been acquired by the use of a hand-held Global Positioning System (GPS) while travelling on the trains. Freight train speeds have been obtained from observation and timing.

Some noise source terms are provided in the calculation method CRN [5]. Others have been obtained from a report commissioned by the Defra.

Noise in railway stations is not specifically covered by the calculation method. A research project is currently under way to provide noise source terms for these situations.

Midland Metro (Birmingham's Tram system)

Flow data for this will be taken from the published timetable.

Sample speed data has been obtained from the operators and this is being crosschecked against data obtained by use of a hand-held GPS.

No noise source terms for Midland Metro are available in CRN [5]. Noise measurements to produce these terms are currently being carried out.

Noise in stations is being investigated as part of the project on mainline railway station noise referred to above.

Aircraft Noise

The UK model for aircraft noise calculation, Ancon 2, is owned and operated by National Air Traffic Services. This model requires information on the number of movements, types of aircraft, departure routes and radar track data.

The operators of Birmingham International Airport have agreed to supply the raw aircraft movements' data for 2004, which we will then be processed into the required format using software written by the Project Team. This software, which is now at an advanced stage of development, will then also be supplied to the airport for their future use.

The processed movements data, along with the radar track data, will then be sent to National Air Traffic Services for them to calculate the 10m x 10m grid-based noise levels on our behalf.

3.2 Progress with End-User meetings

A large number of organizations were consulted to determine their requirements as potential end-users of the data from the BUMP Project. They included:

- Birmingham City Council's own Planning, Transportation, Landscape Development, Housing and Education Departments.
- Similar departments at Solihull MBC.
- Birmingham International Airport Ltd.
- Centro, the region's public transport provider.
- The local office of the Government's Highways Agency, which is responsible for motorways and major trunk roads.
- The local office of Network Rail.

During meetings with these organisations a large number of issues were discussed. These discussions covered the use of the data that BUMP would produce in 2007, but also the use of the completed model to run further simulations to assess the impact of proposed building or highway schemes. The following is a summary of the main conclusions.

It was agreed that the model would be useful at every stage of the planning process, for:

- Strategic Planning
- Local Area Planning
- Detailed Planning Control issues (for example to determine the need for sound insulation in buildings)
- For linking noise to other data on environmental parameters such as air-quality.

Similarly a wide variety of applications were anticipated for transportation issues:

- To inform the strategic local transport plan
- To evaluate detailed options for new roads and traffic management schemes.
- To optimize the use and location of noise barriers.
- To assess proposals for new metro routes and noise mitigation measures.
- To evaluate proposals for new bus lanes.
- To include in the appraisal of 'Park and Ride' schemes.

The more general conclusions from these meetings were:

- Users should be able to access the mapping information directly electronically (but as ‘read-only’)
- Some groups felt that there would be advantages to them running their own scenarios on the model but the complexity of the methods would be prohibitive currently, so the project team would run them on their behalf
- It was felt important that the noise specialists should provide reports in ‘plain English’ as many people find noise information difficult to understand.

4 Verification and measurement

An integral part of BUMP is to carry out noise verification measurements both in Birmingham and Solihull. This process has already been started with a series of weeklong measurements at various locations. The final strategy for this verification process will be produced shortly (see section 5 below).

5 Future work programme

The future work programme for BUMP is as follows:

- End of May 2005. A report will be produced detailing the outcome of the end-user discussions.
- End of May 2005. A proposed strategy for verification of the noise maps will be produced.
- End of June 2005. Receipt of data on topography and topology.
- End of June 2005. All outstanding source data should have been acquired.
- End of July 2005. A report will be produced for the Defra on the evaluation of the topography and topology data.
- End of September 2005. Model to be built and validated.
- Start of October. Calculation runs to be started.
- End of October 2005. A report will be produced on the acquisition of all data.
- End of January 2006. Calculation runs to be completed.
- End of March 2006. A final report to be produced.

6 Summary

The Birmingham Updated Noise Mapping Project is, at the time of writing, fourteen months into a two-year programme. This paper is a report of progress to date.

A wide variety of potential users of the output of the project have been consulted on their requirements. All organizations have been enthusiastic and supportive of the project. The data provided by the initial run of the model will be of value to these bodies as well as the facility to run proposed scenarios for strategic or detailed purposes in the future.

The bulk of work to date on the project has been to gather the required detailed input data and to put it into an appropriate form compatible with the mapping model. This has required extensive resources and work continues in this area. Despite a number of difficulties encountered in obtaining suitable data the project remains on schedule to be completed in March 2006.

References

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