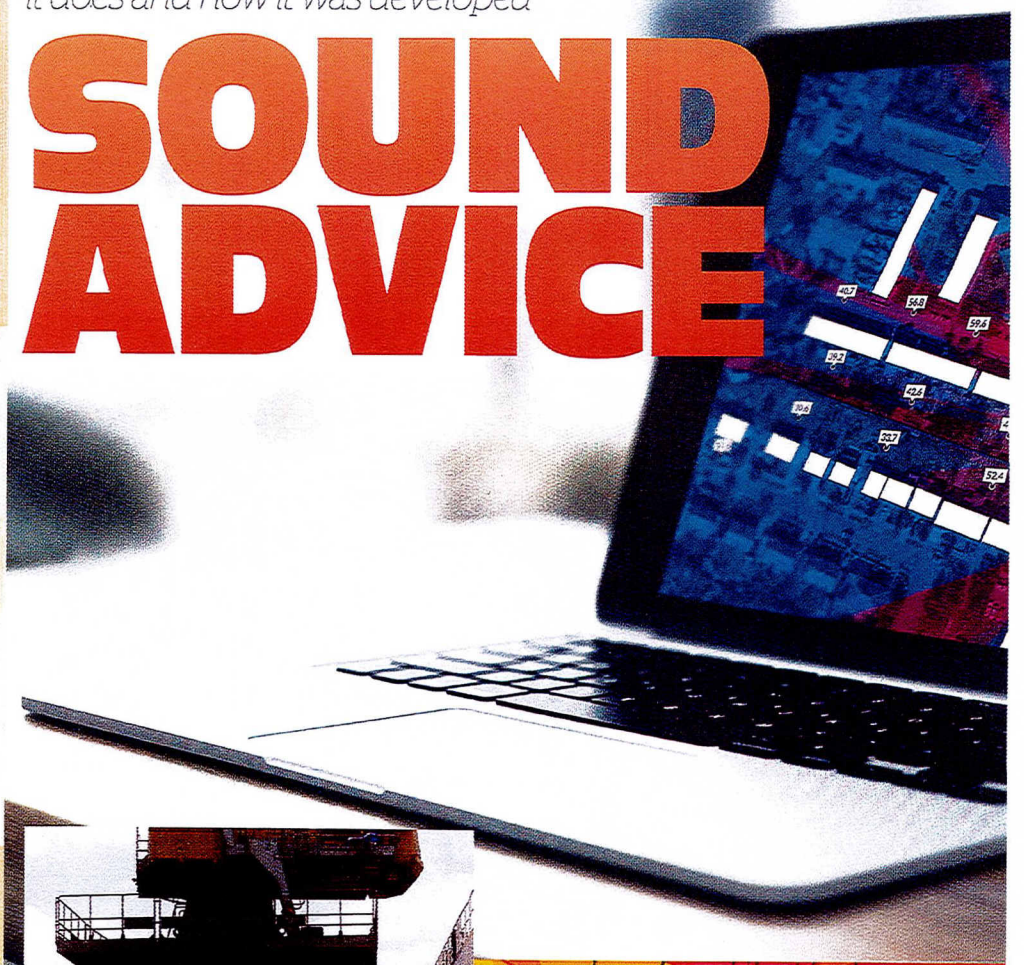
Free software is available for EHPs to map noise on their computers. ***Duncan Stigwood*** *explains what it does and how it was developed*

SOUND ADVICE



Part of the job of noise consultants is to improve understanding of noise and acoustics and debunk some of the myths that lead to bad judgements and future land-use conflicts. All too often we see the consequences when decision-makers get it wrong and, like those in environmental health departments, we often end up at the sharp end, trying to resolve the problems. My company, MAS, also trains EHPs in how things are being done wrong – for example, misapplication of World Health Organization guidelines.

Over the years, I've assisted in creating training tools, exercises, posters and software to assist in improving technical and practical knowledge. I hold a diploma in acoustics and have a professional background as a web designer and sound engineer. But I have often found myself frustrated at the lack of usability of acoustics software.

About 15 years ago, my father, Mike Stigwood, asked me to make him a website for his environmental health consultancy. Ever since then, I have been teaching myself how to develop for the web.

In 2006, I created a basic noise source calculator using JavaScript. Then, in 2008, I turned to Adobe Flash to create an interactive noise data graph that acted as an audio-visual method of sharing recorded data online. They have both been used as aids for decision-makers and the courts.

Recently, we launched free browser-enabled software that can model sound levels to help map noise. The tool requires no download, works on any platform, and fully meets the requirements of ISO9613, the official standard used to calculate outdoor sound levels. It is designed to encourage testing and analysis of calculations and to provide a better understanding of how sound modelling works.

We hope that the tool will help EHPs to test the accuracy of noise impact assessments and the value of noise mitigation measures, and to expose some of the limitations of modelling.

I spent a lot of time trying to improve the tool's user experience so that it is as simple and intuitive as possible. The modelling page is easily applicable in everyday situations and a new user only needs to understand the bare minimum to get started. The objects shown on screen are designed to be easily disabled and re-enabled – for example, by clicking any object, you can disable it and instantly see the effect on the frequency bands at receiver points or the overall levels on the noise map.

The tool is designed to be used not just as a calculator but also for learning. For example, I created an object called a ray receiver, which

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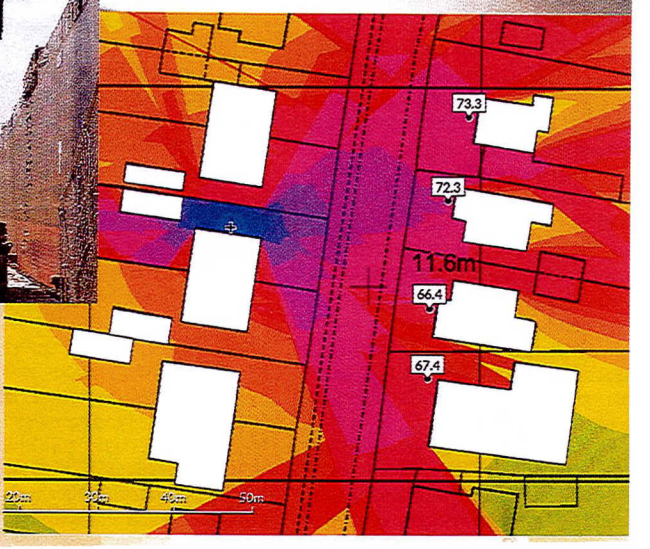

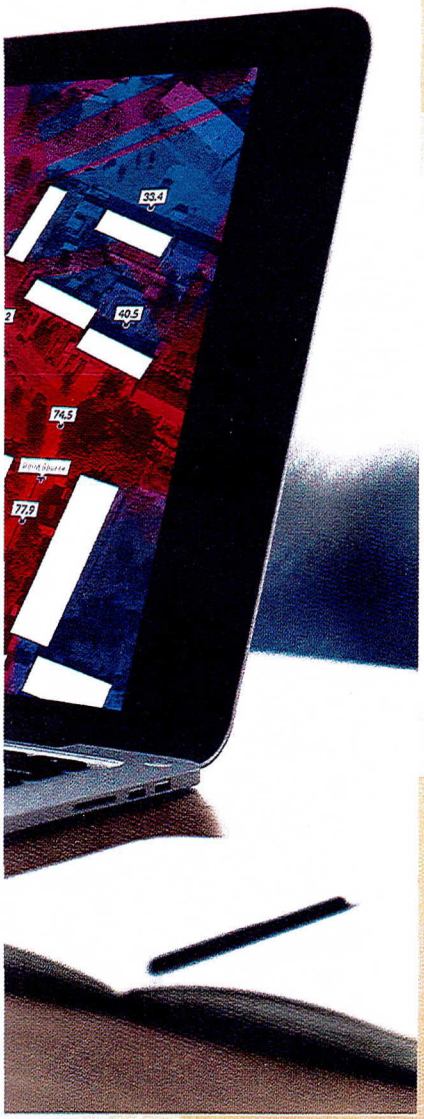

draws lines from all sources in a way that illustrates which sound paths contribute to the decibel level at that point. This can include up to two levels of reflections and vertical diffraction. These rays can be drawn as waves with wavelengths shown to scale, helping to illustrate standing waves and why screens may be too small to reduce noise.

I wanted it to be possible for complex models to be passed on using just a website address and to be viewed by anyone for free on desktop computers and tablets (it also works on mobile phones but is not currently available as an app).

Using web standards that all modern browsers follow on PCs and Macs, models are generated on the users' computers and the calculations are processed when needed. Users are free to make any changes they like and see the results instantly. Each change is logged as a new page, so the user can undo a change with the back button or save it by creating a new bookmark.

Models can be easily created by local authority EHOs, by architects, by members of the public affected by noise, or by acoustic experts who would otherwise not have access to expensive noise mapping software. Their data can easily be shared with others who can analyse and expand on the models.

To keeping waiting times to a minimum, calculations run in the background progressively so that you are quickly given a rough result for the sound level map, which becomes more detailed over time. The appearance of this is similar to when images start off blurry and become sharper as they are downloaded. This gives users feedback while they are editing, without requiring a full calculation to be performed for every change.

I have provided toggles so options can be easily disabled to better understand their effects on the results. This facility is not always as transparent in other tools.

There are some limitations in the tool due to the limits of browser-based programming or because certain features have not yet been developed. For example, there is currently no consideration of ground-level topography, although this should only have a small effect on the final results and will be added if there is demand for it.

One difficulty I encountered was vertical edge diffraction, which posed a very complex problem to solve. As complex ray tracing would be programming-intensive and I felt was beyond the scope of the model, I decided to consider vertical edge diffraction only for simple situations where the objects intersected the direct path and there was an unobscured path around them.

This means that the diffraction around screens with a degree of complexity, such as multi-faceted buildings with an unusual shape, are not always fully represented in the model.

Additionally, ISO9613-2 considers the effect of screens that are along the path from the source to the receiver, even when the source is still in sight of the receiver.

In the real world, a tall vertical screen that stands to one side of the source-to-observer eyeline would have an attenuating effect. But it didn't seem possible for the model to account for such a situation along vertical edges so the attenuating effect of the vertical edge of a screen is only considered when you are in the shadow of the screen. As a result, attenuation in such a situation would not be represented in the model until the observer has moved behind the screen.

I'm hoping the tool will be as useful as the previous tools that make up the most popular pages on our website. If there is popular demand for it, I will take the project further, adding other features such as line sources and roads based on other standards, ground topography and 3D views.

Although we cannot afford to provide free technical support, we are very keen to hear feedback from users including bugs, improvements and ideas for new features. **You can access the tool by visiting masenv.co.uk/dbmap. A video tutorial can be found at masenv.co.uk/tools**

Main features

- Calculating sound sources while considering the effect of:
  - Distance attenuation
  - Geometrical divergence
  - Screening by obstacles
  - Air absorption
  - Ground effect
  - Reflections.
- Modifying various parameters and conditions of ISO9613. For example, disabling the 20/25dB barrier attenuation limit to see what effect this has.
- Instantaneous calculations that run progressively in the background.
- Various export options including a detailed breakdown of calculations as a spreadsheet and DXF file input/output.
- Google Maps integration – all you need is a simple location search to insert an aerial view at the correct scale.
- Support for drag-and-drop of local image files.
- Built in website address (URL) shortener using the domain dbmap.co.uk.
- A comprehensive guide covering the features of the model, the limitations of the calculations and what users can expect regarding their privacy.

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Duncan Stigwood is lead technical adviser for consultancy MAS environmental