

## Rail Infrastructure Environmental Noise Management

### New Technology is Redefining Best Practice

#### Background

There have recently been **four key developments** in the technology available to minimise the disturbance (and hence potential complaints) caused by noise from rail and other infrastructure maintenance, refurbishment and building projects. These techniques can dramatically reduce the noise and disturbance from sites, providing substantial benefits to the local residents - and hence to councils and to contractors.

- **Mobile Acoustic Barriers - reducing the noise transmitted**

New and innovative, easily handled, lightweight barriers that can be fitted and removed very quickly, making it possible to reduce the noise on short term projects e.g. track maintenance with limited access time.

- **Psychological Silencing - acoustic camouflage**

This makes use of human psychology to reduce complaints by hiding or masking annoying noise using an array of loudspeakers replaying carefully sculpted sound signatures.

- **Intelligent Noise Monitoring - closing the site noise management loop**

Provides the site manager with real-time feedback to facilitate noise management and also provides the call centre with specific event information to improve the quality of their response to complaints.

- **Engineering Control at Source - reducing the noise at source**

New engineering noise control techniques and materials are used to retro-fit measures to reduce the noise from plant at source without affecting normal operation.

#### Case Studies

##### Edgware Road Station - Night time track maintenance; **from regular complaints to zero**

As the station is overlooked by numerous apartments and flats, nighttime noise from track maintenance activities had previously been a sensitive issue that had given rise to regular complaints. Balfour Beatty, the contractor involved, decided to take a proactive step by embracing new techniques and technology. The key noise issues identified were delivery and pick-up of equipment through the station entrance and the staff welfare facilities. The Iris solution involved relocating welfare facilities to take advantage of existing site screening features coupled with temporary acoustic barriers - not just for the facilities, but also for the vehicles and workforce at the station entrance. Intelligent Noise Monitoring was also installed to record audio samples of potential nuisance events, as were a pair of Psychological Silencing systems (station entrance and welfare). Despite being inaudible the other side of the street, these systems were very successful at camouflaging the site noise. The combined effect: not just zero complaints, but also an email from a previous complainant complimenting the company on the effectiveness of their noise management.

##### Baker Street Station - **track maintenance and platform construction**



Baker Street is a particularly difficult location with respect to noise as the track is overlooked by high rise dwellings on all sides. Moreover, the construction and maintenance projects were scheduled over several weeks. The best practice procedure (see overleaf) showed the optimum combination of measures was: use temporary Echo Barriers at the entrance; install an Intelligent Noise Monitoring system at the centre of the site (the audio recordings pinpointed the two main sources most likely to cause complaints); install two Psychological Silencing systems to reduce the perceived site noise at night by overlooking residents.

##### Westbourne Park - **West Way ballast transfer station**

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## Defining Rail Infrastructure Environmental Noise Management Best Practice

### Mobile Acoustic Barriers *Innovations reduce the transmission of noise off-site*

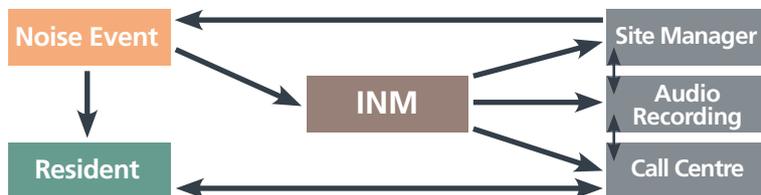
Whilst substantial noise reductions (up to 15dB) are possible using acoustic barriers, the practical and technical problems associated with the previous generation of barriers prevented widespread adoption. However, the latest development of the concept from Echo Barrier includes innovations that eliminate these issues. Consequently, it has become very easy to introduce these new acoustic barriers to reduce noise problems across a wide range of sites (Heras or other fencing, scaffolding etc), even for very short periods of time. The key Echo Barrier innovations are:-

- lightweight (making transport and installation easy) yet high performance (the attenuation can be trebled locally if required) - ease of use makes them more likely to be installed correctly.
- weatherproof (does not soak up water like conventional materials)
- acoustically absorbent (sound is not reflected, increasing the performance)
- 70% reduction in installation time (barriers can be used even on short-term noisy activities)



### Intelligent Noise Monitoring - *closing the loops*

In addition to logging the usual noise parameters, this monitoring system adds very sophisticated and intelligent identification of any event likely to cause complaints. Once an event has been identified, it sends a notification by text / email to the site manager so that he can immediately take action - closing this loop. It can also notify the call centre to generate a log of events. The system also records an audio sample of each event, accessible by the call centre so that they can improve the quality of their response (someone dropped tools into a bin - it has been dealt with), closing the second loop.

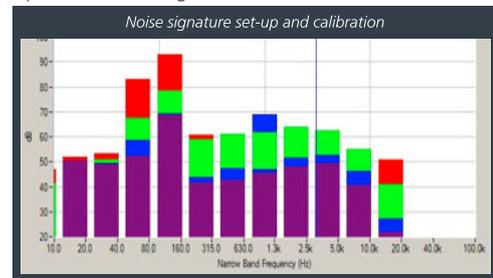


In addition to the ability to log on to the system from anywhere over the internet, (and even to listen live) the audio recordings are also used afterwards to identify specific noise problems as part of a process of continuous improvement.

### Psychological Silencing - *acoustic camouflage*

This is an innovative, low cost solution to a range of difficult environmental noise problems where sound with "character" could cause or has caused complaints. It can either be used in conjunction with noise control measures or where noise control would be too expensive or impractical. Based on research into the subjective response of people to noise characteristics, the Psychological Silencing system generates bespoke sound with a sculpted signature that "camouflages" the nuisance features in the noise from the perception of potential complainants. Once initial set-up and calibration testing has been carried out, the sound signature is designed and an array of loud-speakers used to generate a diffuse sound field with the right characteristics and amplitude for the particular environment.

It is a strange experience, encountering sound you don't hear "disappearing" those you found annoying...



### Noise Control at Source

By taking an engineering approach to noise control and using new materials and techniques, it is often possible to reduce the noise from specific items of plant at source. These projects can either be linked with the supplier/manufacturer, or can sometimes be temporarily retro-fitted on site. The key to the success of this approach is the engineering expertise used to generate low cost, practical modifications that do not have an impact on combine operational requirements. Examples include retro-fit modifications for rock-drills (10dB reduction); elimination of the classic diesel engine "throb" via purpose designed additional reactive silencers (up to 20dB reduction) on generators and large vehicles; 10 - 20dB reductions in impact noise (hoppers, trucks, wagons); 8dB reduction in low frequency noise from vibratory sieves...

### Defining Noise Management Best Practice - *the procedure*

Best Practice in noise management must now take into account the new and updated techniques described above in addition to the existing conventional site noise programmes. The following process must be followed (in addition to standard site noise management practices) in order to define exactly what constitutes best practice for any particular site.

- Prediction of noise levels (as per traditional approach)
- Evaluate the options for noise control at source for the dominant site noise sources
- Assess the options to reduce the spread of noise from the site (barriers, geometry, planning)

#### If there is still the possibility of noise complaints -

- Evaluate whether Intelligent Noise Monitoring is necessary to improve noise management and feedback
- Determine if Psychological Silencing is needed to improve the acoustic environment to reduce the likelihood of complaints



**This process must be followed in order to be able to define what constitutes best practice for any site.**

Contact us for further information or if you would like to discuss any of the above in more detail.