

DUBLIN'S METRO NORTH: THE ROLE OF INDEPENDENT ENGINEERING EXPERTS

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SYNOPSIS

In 2008, the Irish Railway Procurement Agency (RPA) agreed to provide independent engineering advice for the benefit of property owners and residents possibly affected by the construction and operation of Metro North. RPA's initially published objective was for the experts to provide to the public accessible information about the scheme and proposed mitigation measures for significant impacts. This objective quickly developed to include promotion of meaningful consultation enabling local concerns to be translated into technical solutions in some cases.

The team of Independent Engineering Experts appointed in July 2008 comprised specialists in tunnelling; geology, geotechnics and ground modelling; noise; vibration; and water. Members of the team were also experienced in environmental impact assessment and community liaison and mediation. At the time of appointment, a reference design had been completed and a Railway Order application had been published for public consultation. The experts' first report (March 2009) reviewed the Railway Order application and Environmental Statement in language accessible to members of the public. It also provided non-technical explanations of relevant engineering methods and environmental assessment concepts and methodologies and included a synthesis of residents' concerns. The scheme was the subject of a public Oral Hearing which started in April 2009 and eventually concluded in May 2010. A Railway Order was granted by the Irish planning authority, An Bord Pleanála, on 27th October 2010 (operational from 23rd December 2010). In its determination of the Railway Order, An Bord Pleanála determined that the route should terminate at the proposed Estuary Stop in Swords, and not at Belinstown as proposed in the application. Belinstown was to have been the location for the main depot for the scheme and for spoil management from the construction phase. A further Railway Order application has therefore been submitted (May 2011) for a depot and spoil management facility at Dardistown, south of Dublin Airport.

This paper describes the work that was done and the value and outcomes of the appointment of independent engineering experts from both the client's and experts' perspectives, looking back. It reflects on: cost-benefit of this approach; how the independence of the experts was assured (and perceived); response from the community and RPA, and the deployment of listening and communication skills alongside technical expertise. The value of the experts' role in 'translating' information provided by one party into a form accessible to the other will be considered in relation to achieving genuine dialogue and common understanding (even if this involved articulating an agreement to disagree rather than reaching agreement). Facilitating effective communication was equally important in the transmission of engineering details and concepts to the public and to relaying residents' fears and objections about the proposals to the client.

INTRODUCTION – THE SCHEME

Development of an extensive metro and light rail network for the Greater Dublin Area is a key element of the Irish Government's strategy for tackling traffic congestion in Dublin, enhancing economic competitiveness and ensuring a sustainable, attractive city. RPA has successfully delivered the first two lines of this network, the Luas Red and Green Lines.

Metro North, which will run from Swords, the county town of Fingal in north Dublin, through Dublin International Airport and on to the city centre, is the lynch pin of this strategy. As well as providing a long awaited rail link to the airport, Metro North will enable passengers to transfer between suburban rail, metro and Luas at a number of interchange stations. It links the Dublin City University main campus with St Patrick's College and Clonliffe College in Drumcondra and Trinity College in the city centre, providing opportunities for these educational institutions that do not currently exist. It serves four major hospitals, including the planned National Children's Hospital of Ireland. It also serves Ireland's national sports stadium, Croke Park.

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BACKGROUND TO EMPLOYMENT OF INDEPENDENT ENGINEERING EXPERTS

Since its establishment in 2001, the Railway Procurement Agency, RPA, has adopted an open and honest culture in its dealings with members of the public and business. Initially established to implement and operate Dublin's first two modern light rail lines, the Luas Red and Green lines, RPA recognised that it was not simply a project office constructing a major infrastructure project. Instead, the focus was very much on the fact that RPA was providing a future transport service which it wanted the people of Dublin to take to in large numbers. RPA recognised that the very people who were being impacted during the construction phase were the future potential customers of the Luas system.

RPA adopted an open approach to communications with the public aimed at building public confidence in the safe and efficient delivery of its projects; building RPA's reputation as a good neighbour by keeping the potential negative effects of the works to a minimum and extolling the long term transport benefits the projects will deliver.

The first two Luas lines have been a tremendous success. Passenger numbers in the early years exceeded all expectations and have continued to grow. Even in the recent difficult economic circumstances, Luas passenger numbers have been maintained at a steady level, compared to sharp declines in other transport modes. Luas has generated an operating surplus in every year since it first opened for passenger services in 2004.

While many factors have influenced the ongoing success of Luas, RPA's approach to its dealings with the public has played its part. In a major opinion survey carried out by Dublin City Council in 2010 ("Your Dublin – Your Voice"), Luas scored the highest of all infrastructure projects, with 98% of participants believing it has had positive impact on Dublin.

The Luas success story has continued since 2004 with the opening of the Docklands extension on the Red line and an extension of the Green line to Cherrywood in south Dublin. The success of the original Luas lines facilitated communications with the public on these projects. The public were familiar with what to expect in terms of the construction phase and were well aware of the benefits to come. However, when the Irish Government approved the development of Dublin's first underground metro line in late 2005, it quickly became apparent that RPA faced a new challenge in terms of its communications philosophy.

RPA commenced an extensive public consultation process in early 2006 initially aimed at informing the selection of a preferred route. Consultations continued through the development of detailed alignment and station design up to the lodgement of the Railway Order application in 2008.

These consultations involved explaining concepts with which the public were unfamiliar, such as ground movements, groundborne noise and vibration. People were particularly fearful about tunnelling under or close to their properties, and about the impacts once the metro passenger services commenced. These fears were exacerbated by the fact that Dublin's only previous major tunnelling scheme, the Dublin Port Tunnel, engendered some sensational and often wildly inaccurate publicity and rumour during its construction phase.

Despite RPA bringing its consultants to public meetings, including such eminent experts as Professor John Burland, OBE and Rupert Taylor, there was invariably someone in the public audience who "knew someone whose house collapsed" during the construction of the Dublin Port Tunnel, and who the audience were ready to believe. Of course, no houses did collapse during that project.

The idea of providing independent advice to residents at the planning stage arose from one such public meeting. The residents affected by the Dublin Port Tunnel scheme had not been provided at the planning stage with access to independent experts whose job it was to listen to their concerns and provide technical explanations. However, an independent engineering expert⁴ was appointed by Dublin City Council part way through construction when public alarm and protest threatened progress. Before the expert was appointed, the overriding concern of residents during construction works could be expressed as "Things are happening that I don't understand. The tunnel hasn't reached me yet but I've heard it causes noise and vibration and that these damage buildings. How do you know it's going to be OK?" The appointment of an independent

⁴ Dr Michael DeFreitas – co-author of this paper and a member of the Dublin Metro North independent engineering expert team.

engineering expert was successful in reassuring affected residents that their properties were unlikely to be damaged but that, if they were, this would be rectified. The appointment led directly to an improvement in liaison with the public and provision of real time information on the progress and effects of the tunnelling. However, the essential basis of trust (sometimes referred to as a "social licence to operate") had been broken early on (or never established). This legacy was a problem for RPA in establishing an effective dialogue with the public over Metro North.

Against that background, RPA took the decision to appoint independent engineering advisors to be available to provide advice to the public at the earliest possible stage – the publication of the proposals in the form of a Railway Order Application. This was a new departure and there were clearly some significant potential disadvantages. Of most concern was the risk that RPA would be facilitating persons who wished to object to the planning application (whatever its technical merits and wider social benefits). The cost of providing the advice was also a concern. Having given the issues due reflection, RPA felt the project overall would benefit from continuing its strong commitment to openness and the decision to provide advice was taken.

THE WORK OF THE INDEPENDENT ENGINEERING EXPERTS

The Consultants' terms of reference

The terms of reference for the Independent Engineering Expert team were developed by RPA in partnership with residents' representatives, who also participated in the selection process. The principal objective of the work was to undertake a detailed review of the Railway Order application documents (especially the EIS) and provide a review report to residents. This report was to be accessible to a non technical readership so as to assist residents and others in navigating the application documentation and understanding its content.

Programme of work and approach

A series of meetings was held with RPA engineers, residents' groups and other interested parties in August and September 2008. Following those meetings and a review of the documentation, a draft report for comment and discussion was issued on 8th October 2008.

Further meetings with residents and RPA were held during the week commencing 20th October 2008 to present the draft report and allow discussion and feedback. The draft report was issued in time to be of assistance to residents and groups of residents in making written submissions to the planning authority, An Bord Pleanála, by the due date at the end of October 2008 summarising the points they wished to raise in the Oral Hearing. The Experts did not review or comment on residents' submissions except where asked to do so, and then only from a factual/technical point of view.

In total, the experts held 41 meetings with RPA and residents. Two of these were public meetings, attracting a total of 80 people; the others were private meetings between the Experts and groups of residents or between the Experts and engineers from RPA. The Consultants worked closely with an RPA public relations officer who made all the initial arrangements for meetings and made invaluable personal introductions based on an established database of contacts throughout the route. This accelerated the process of establishing a working relationship with individual residents and groups of residents and helped to ensure that nobody who wished to meet the independent experts was overlooked.

All the feedback from the meetings and some related correspondence was incorporated in the October draft and a final report was issued in March 2009. The report is freely available to download from a dedicated website set up by the Consultants⁵ and also on RPA's website. It was a document made available to the Inspector at the Oral Hearing.

The primary purpose of the first set of meetings with residents was to introduce the expert team and to listen to and record their concerns and requests for information. These were important meetings in establishing trust between the Experts and both residents and RPA engineers. To win the trust of the residents it was necessary to convince them that it was no part of the brief to promote the project on behalf of RPA. From the RPA perspective, they required reassurance that the Experts were not helping residents to oppose the scheme at their expense.

5 <http://gwp.uk.com/metronorthexperts/>

Some simple 'rules of engagement' were set out to demonstrate independence and impartiality. The most important of these was a commitment from the experts to keep confidential all discussions between them and participants in the meetings, except where specific agreement had been obtained to communicate information to others (*e.g.* specific questions or requests for information from residents). The Experts also operated on a "no question is stupid" basis. In confidential meetings, facilitated by an experienced 'listener', this revealed strongly held fears about the scheme and unanswered questions that people had felt too daunted to ask – or if they had asked them, they had not understood the answers they were given.

The later meetings focused more on explaining technical concepts, 'translating' RPA's responses to residents' questions and presenting additional information in ways accessible to the public.

The Independent Experts' report

The report was presented in three volumes:

Volume I provides an introduction to environmental impact assessment and the design process, together with a review of selected sections of the Environmental Impact Statement and other Railway Order documentation;

Volume II provides a summary of the particular concerns and questions of residents and other interested parties, cross references to sources of further information and brief comments where appropriate; and

Volume III includes supporting appendices for Volumes I and II.

The report was intended to be available to residents and others as a resource to assist them in their consideration of the Railway Order application for Metro North, and in participating in the consultation process (including, as appropriate, making written and oral submissions to An Bord Pleanála).

Volume I of the report is based on a review of the Environmental Impact Statement (EIS), backed up by reference to the plans showing details of the proposed railway works. The review considered the adequacy and clarity of each of the elements of the EIS for topics of particular interest and concern to residents. The Experts also attempted to identify gaps or unanswered questions that arose from the Railway Order Application (especially the EIS and the drawings describing the scheme).

Even with the inclusion of a Non Technical Summary, an Environmental Impact Statement is of limited usefulness to a non-technical readership without some additional guidance. Volume I of the report therefore attempted to bridge this gap by presenting the findings of the review in three main sections:

- An introduction to the EIS, explaining its structure and purpose.
- A background section intended to set the scene for residents to help them appreciate the stage that the engineering design of the scheme had reached and how it would be refined between the planning and construction phase. This section also included a non-technical introduction to tunnelling and associated works, such as station and shaft construction.
- A description of the key environmental impacts relevant to the project and to the concerns of residents.

Volume II of the report summarised the general and specific issues raised by members of the public during meetings and correspondence with the Independent Engineering Experts during the period August 2008 to January 2009. For each topic covered, the main objectives of this volume of the report were to:

- Provide cross references to information in Volume I and the Railway Order Application that is relevant to the questions and concerns that had been raised with the Experts;
- Navigate the Railway Order Application documents (especially the EIS) so as to find information relevant to each issue of concern to residents;

- Provide an update (where relevant) on the current status of ongoing discussions between residents' groups and RPA and on progress with important schemes for property protection and monitoring; and
- Provide assistance to residents and others in framing their questions, concerns and requests for information, whether made directly to RPA or at an Oral Hearing (or both).

This volume of the report confirmed to residents that their concerns, opinions and requests for information had been heard and understood and that they had been articulated in a manner that RPA and the planning inspector could readily understand. It provided for RPA a synthesis of the objections they would be likely to face at the Oral Hearing and the opportunity to engage in further consultation with those concerned and/or respond in detail at the hearing. Whilst Volume II provided residents with the means to present their own submissions to the Oral Hearing, it did not comment on the validity of the opinions expressed or the objections raised – simply described what they were.

THE CLIENT'S PERSPECTIVE LOOKING BACK

RPA applied for a railway order for Metro North in September 2008. The railway order process was protracted through requests for further information and a large volume of submissions by objectors. The railway order was eventually granted in October 2010.

In truth, it's likely that the vast majority of individuals who would be potentially affected by the construction of Metro North gained little from the appointment of an independent expert by RPA. This is not in any way to do with the way the experts went about their task, it simply reflects the fact that the vast majority of individuals show little interest in construction works that seem a long way off in the future. This is further illustrated by the response to another RPA initiative, the Property Owners' Protection Scheme. Under this scheme, property owners are offered free before and after condition surveys of their properties, and repairs of up to €30,000 in value on a no questions asked basis. However, despite several "recruitment drives", two years after its launch only 275 of a total of 1200 eligible property owners have signed up to the scheme.

The people who gained most were the local lobby groups which had been established to oppose the project. The insights gained by these groups from their interaction with the independent experts did leave them in a better position to mount a challenge to the project at the Oral Hearing.

However, it also left RPA in a better position to defend the project at the Oral Hearing. The process brought greater clarity in relation to the specific concerns of the public and RPA was able to ensure these concerns were adequately addressed in its railway order application. RPA was able to take on board suggestions from the independent experts for additional mitigation measures. The lengths to which RPA had gone to explain the impacts of the project to residents and to understand and address the residents' concerns (including the appointment of the independent experts) stood to RPA at the Oral Hearing. The railway order was ultimately granted with only 20 conditions, remarkably few given the length of the construction corridor and the complexity of the works. Only two of these conditions related to the specific concerns of residents in particular areas.

The greatest benefit was probably that the process served to enhance RPA's reputation of honesty and openness and helped establish greater trust in RPA with the local communities. The independent expert's report largely supported RPA's own analysis of impacts as set out in the project environmental impact statement and the recommended mitigations. In the end, most members of the public felt they had a fair hearing of their concerns at the Oral Hearing and they are now ready to carry on a constructive engagement with RPA as the project progresses.

While the future of the project depends on Ireland's economic recovery, the project continues to win the hearts and minds of the Dublin public. In the same "Your Dublin – Your Voice" opinion survey, 85% of people surveyed were positive about the impact Metro North could have on Dublin.

THE CONSULTANTS' PERSPECTIVE - REFLECTIONS ON DELIVERY OF EFFECTIVE ENGINEERING EXPERTISE TO THE PUBLIC

Reactions to the work of the experts on Metro North

One group of residents' representatives remained suspicious of both RPA and the experts throughout the process, seeing conspiracies at every turn. However, all of the other groups and individuals who were involved in the work expressed relief that their concerns had been not only aired but 'heard' and taken seriously by the experts and articulated in language equally accessible to them, RPA, and the planning inspector. The report gave some groups confidence to make suggestions for changes to the scheme, which they presented to RPA, in some cases after asking the experts to review their submissions. These residents also felt they had access to information which would help them make balanced evaluations of alternatives rather than digging their heels in for what they first thought of. As RPA observed, the process was important in ensuring that the public felt that they had received a fair hearing, even if ABP did not agree with their point of view and impose conditions or require changes. The consultants also think that the process has given the public more confidence to engage directly with RPA. The report was and remains a useful and accessible resource to all stakeholders and certainly helped to focus the public submissions that the consultants saw. Its availability may well reduce the amount of help, if any, that residents will need when the construction phase commences, although that remains to be seen - as RPA observed, the vast majority of residents left it to the residents' associations or ad hoc action groups to fight (or took no notice at the planning stage because it didn't seem to matter to them/they felt it would never happen anyway because of the economic situation). However, they may start asking questions and complaining when construction actually starts and they will need explanation and reassurance - in some areas the consultants feel that the groups are capable of assisting their own neighbours with the help of our report and expect that this is exactly what they will do.

The need to explain

In order for residents and other non-commercial property owners to feel confident engaging in a dialogue with a developer for a scheme such as Metro North, it is necessary to explain how geologists can know what is beneath ground level, how engineers can make decisions based on that knowledge and how engineering can accommodate those aspects of the ground which are unknown.

But before these questions can be answered, a meeting of residents will invariably start with the question "Would you like this under your property?" It is absolutely essential to be honest and in this case the answer was "No, I can see how difficult it is dealing with the uncertainty that this project, which has been imposed on you".

Working with residents means helping them to accept schemes you would not welcome under your own house, whilst helping them to articulate their fears and concerns. Thus it follows that the reassurances sought by someone familiar with tunnelling should also be those which have to be given to the public, *viz*:

- that investigations have been completed by competent people who, because they are Chartered, have elected to have their actions open to scrutiny by their peers;
- that design of the works has honestly recognised the nature and extent of the unknowns associated with the ground and arranged the works to be done in such a way that controls these should they occur;
- that the ground is instrumented so that its real behaviour can be compared with its predicted behaviour so revealing in real time differences between conditions which were expected and those which exist; and finally
- that a system of planned responses has been established so that the works are always under control.

Each of these concepts will be new and, even when explained in plain English, listeners who know what you are saying (and with whom a relationship has been established so they are ready to listen) will not necessarily know what you are talking about. Analogies with the everyday life of ordinary people have to be used for them to translate these ideas into meaningful understanding of what is involved and its implications.

Concerning competence; analogies to the training and work of doctors, the specialists within the medical profession, the services provided by dentists, chiropodists, physiotherapists *etc* enable the concepts of

undergraduate and postgraduate training, professional registration and the like to be translated into everyday language.

Matters of design are slightly more difficult to explain but can be related to everyday occurrences; three packets of tea are likely to be of very similar weight but not exactly the same weight, and to contain tea. People are happy to trade on this basis because they trust the technology and have access to redress if something is wrong (*e.g.* the tea is contaminated). So it is with geology and engineering where the "redress" includes treating the ground to improve it, designing the tunnelling machine to be able to probe ahead, treating the ground from below ground, supporting the ground as it is excavated etc. These are subjects many engineers outside the subject know nothing about and so it is expecting much from the lay person to comprehend its effectiveness.

This is where scaled physical models are of priceless value; three are basic in a tunnelling project

1. A model of a TBM is essential, ideally with moving parts so that its manner of working can be demonstrated. Provision of such a model and a video of how it works should be a necessary part of every contract.
2. A 3D model of good ground, from ground level to one tunnel diameter below invert, to show strata types, bedding, joints and groundwater levels. This model is needed to explain how excavation will occur under ideal conditions and how support will be provided.
3. A 3D model of poor ground, from ground level to one tunnel diameter below invert, to show strata types, bedding, joints, faults, karst etc and groundwater levels. This model is needed to explain how excavation will cope with difficult and unforeseen conditions, how they will be detected, how they will be overcome and how support will be provided.

It may be necessary to have more than 2 geological models depending on the types of ground along the line of the tunnel. These models also provide an ideal introduction to instrumentation and monitoring.

Knowledge that the ground is instrumented (or will be) brings great comfort to anxious residents worried about displacement and vibration, including noise. However such arrangements have to be matched with programmes for monitoring and integrating the data in real time. It is most helpful for residents to see and handle examples of the instruments being used; stand pipes, piezometers, seismometers, inclinometers, load cells etc. to explain how they work and how the data they produce is handled.

The need to Respond

Response mainly occurs in two phases, at the very start of the scheme and once construction commences.

Phase 1. Residents who are encouraged to be "party" to the design and execution of a scheme will rapidly turn Public Consultation to ashes if there is no flexibility in design to respond to their concerns. Lack of flexibility can arise from a number of causes but the primary cause is starting consultation too late in the procedure; suspicions will be raised and misinformation generated as soon as "scoping" for a project commences.

Flexibility to respond is further reduced by prior agreements between the client and local authorities to complete the works as designed by the client, and by out-sourcing of design so that very few within the client's organisation know the whole story and almost no-one can provide a definitive answer to seemingly simple questions without referring to others – all of which tend to be interpreted as revealing a "done-deal".

The public expect there to be someone "the Engineer" who knows what is going on and has authority to change things.

Phase 2. This is where design and reality can part company. Residents have been warned there would be "vibrations" but they did not realise the vibrations were "that" strong – or the noise that loud, etc. People become concerned; "the radiators are rattling; is it safe for the children to be in the house?" Here there has to be a response that understands what the residents are talking about and can reassure them. Experience has shown this is best provided by a technical person rather than "public relations"; anxious members of the public

seeking an answer to a straight question will see PR for what it is. Such technical response should be available during working hours at the very least; answer phones are not seen by residents as part of the deal.

The unwritten Contract

Having the residents "on side" is one of the most beneficial aspects of any scheme through urban areas. Their co-operation, mainly in the form of stoic acceptance that "the job must be done" enables much flexibility elsewhere when needed, especially should things go wrong. But there is little if anything written down; this is an unwritten contract based on mutual trust; the client must trust the residents and vice-versa.

The "deal" is simple; the client wishes to complete a scheme without interruption and the residents wish this to have the least impact on their lives, no impact on the value of their property other than to increase it, and no impact on their environment other than to improve that too. The trade-offs are clear but must not be forgotten. One way to formalise these and engender confidence on both sides is to appoint an independent body to represent the residents at a technical level, as early as possible in the process.