9.0 Engineering and Environmental Implications

The Bridges

9.1 The action plan includes proposals for two new pedestrian footbridges and one new opening road bridge across the River Lee. Whilst earlier sections of this report outline the justification for the inclusion of these bridges in terms of pedestrian and traffic movement, this section is concerned with outlining a preliminary appraisal of the technical issues.

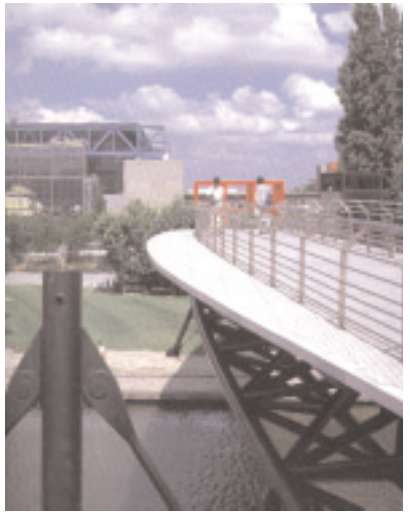
The Pedestrian Bridges

9.2 Two new pedestrian bridges are proposed to link the east end of Custom House Quay with Kennedy Quay to the south and with Horgan's Quay to the north. This would result in an accessible and potentially attractive pedestrian link between the re-positioned Kent Station and Horgan's Quay, the city centre area and the south bank of the river. These bridges would be ideal candidates for an international competition and their position at the river junction opens up unique possibilities in terms of bridge form and symmetry.

9.3 The new Cork Main Drainage interceptor sewer for the central city island runs west to east along Anderson's Quay to connect with the main siphon shaft presently being constructed at the eastern tip of the central island. The new sewer river crossings run north-south under the river on either side of the central island siphon. This infrastructure will impact on the likely position of any proposed pedestrian bridge crossings in this area. Piled foundations will be required for these bridges and adequate safety clearance will be necessary between bridge piles and the new sewer infrastructure.

9.4 Both pedestrian bridges could be designed as lightweight steel deck opening bridges. An important facet of the Action Plan is to revitalise Custom House Quay and Anderson's Quay east as centres for social/cultural activity. The ability of both bridges to open would mean that visiting tall ships and other vessels could continue to berth at these locations. Although the final type and form that these bridges should take would be a matter for a further study, it is thought that a swing bridge type solution may favour this site. Possibly a bridge swinging about a central pier near the north side of the central island. This could allow two equal spans, one across each of the river channels.

New linking channel



High-quality watercourses

The Opening Road Bridge

9.5 Previous sections of this report offered justification for a new road bridge across the River Lee at the southern end of Water Street. Due to the requirement to maintain access for commercial vessels to the city quays upriver of this point an opening bridge has been considered. The bridge would accommodate a single lane each way, with footpaths and cycleways on both sides.

9.6 Construction of a bridge at this position would be complicated by the presence of a new interceptor sewer running down Water Street and then east to west along Horgan's Quay. The existing quay structure is tied back with a series of steel ground anchors running perpendicular to the quay wall. The wharf and quay wall at the old Dunlop works on the south bank of the river does not appear to be in good condition based on a brief visual inspection. All these issues would serve to complicate the construction and design of a road bridge at this location. However, it's not considered that these problems would serve to discount this crossing location.

9.7 Opening bridges are constructed in situations where an acceptable vertical profile for a fixed railway or roadway crossing of a legally navigable waterway is not feasible. Opening bridges result in onerous operating maintenance requirements, high capital cost relative to fixed bridges and inconvenience to both road/rail users and river traffic. However, for crossings at which few bridge openings for river traffic would be required, overall long-term economics may favour the opening bridge.

9.8 Although a number of opening bridge types were considered. It is felt that a trunnion bascule is probably the leading candidate for a bridge structure at this location. It would utilise established technology and would permit the passage of commercial river traffic upriver of this point. It can be justified on aesthetic grounds also.

9.9 The most important aspect of a trunnion bascule bridge is that it does not take up any additional space on the riverbank, whereas a horizontally swinging bridge would take up valuable space along the quayside.

9.10 The bridge form investigated has a double leaf, central opening span providing 30 metres clear span in an opened position. We have included photographs of a similar opening bridge that was constructed near Dunkirk in northern France recently are included.

9.11 The possibility of raising the approaches to the bridge using a maximum allowable gradient of 5% has been investigated. This has the effect of raising the deck level on the bridge such that a clearance envelope of 5.5m high by 30m wide is maintained during mean high water spring tide (MHWS). This clearance envelope would increase in height up to 10.1m during mean low water spring tides. This assumes a bridge deck construction depth of 2 metres.

9.12 Port of Cork have been approached by a manufacturer of high-speed low wash passenger ferries. According to available data, a 150 passenger capacity ferry would have a freeboard of approximately 5 metres and could pass beneath the road bridge in its lowered position at all tide states. Private leisure craft that have a freeboard less than 5 metres would be able to pass beneath the lowered central bridge span.

Pedestrian bridges

9.13 There is adequate vertical clearance at either end of the bridge to allow the inclusion of wide pedestrian underpasses behind the bridge abutments. These underpasses would allow unobstructed pedestrian access along both riverbanks either side of the bridge.

9.14 Alternatively a boardwalk structure could be constructed to pass over the water and in front of the bridge abutments, similar to the boardwalk recently constructed along the north bank of the River Liffey in Dublin.

9.15 Elevated approach roads would have the effect of restricting movement parallel to the river on either end of the bridge. Consideration would have to be given to providing adequate access to and between areas on either side of the elevated approach roads. Indeed further investigation into this issue may reveal that the negative visual and land use implications of the raised approaches are such that an at grade solution is a more desirable alternative.

9.16 An alternative to this layout would be to approach the bridge at grade and have a bridge deck soffit at approximately 1.5m above MHWS. This would result in a visually less obtrusive and potentially more aesthetic solution. However, pedestrians walking along the river bank on either side of the bridge from the west would have to cross above the junctions at the approaches to the bridge assisted by a signal controlled pedestrian crossing.

9.17 The at grade form of the bridge would require less space on either bank of the river. The gradient of the approach roads of the higher solution results in the approach road extending approximately 150m back from the river bank in each case. On the southern side this would require the purchase of additional land and could constrain the options for development of the site in the area of the bridge if the higher solution was adopted.

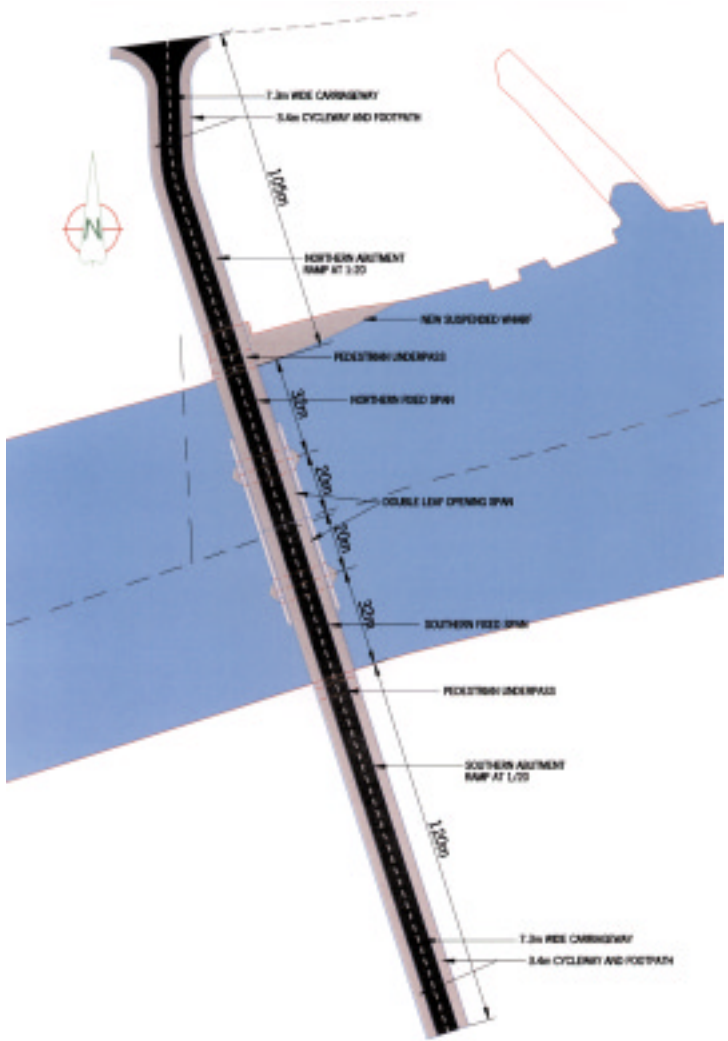
9.18 At grade approaches would reduce the visual impact of the bridge and would not obstruct movement parallel to the riverbanks. In this case, other than vessels of low freeboard at low tides, river traffic would not be able to pass the bridge unless the deck was in an open position. This situation would require that the bridge would open at more frequent intervals than for the raised approach ramps solution. Further study would be required to estimate the likely effects that an at grade opening bridge solution would have on future river and road traffic patterns.

9.19 These issues are explored as part of highway implications in Section 7. Coincidence of bridge openings and closures to traffic will need to be carefully appraised, in the context of vessel movements and traffic conditions. Alternative traffic routing and/or queuing capacity will need to be examined as part of any modelling assessment, whilst impact on Glanmire Road for example will need to be minimised.

9.20 Careful attention should in turn be given to the design of information signage and barrier/control systems, such to notify road users of potential closures in advance of the bridge approaches.

9.21 Attention should also be given to the corresponding control and monitoring of vessel movement, consideration possibly being given to an open bridge condition during nighttime or less busy traffic periods.

9.22 Opening bridges require higher levels of maintenance during their life in use than fixed bridges and a manned control house is assumed for the control of operations.

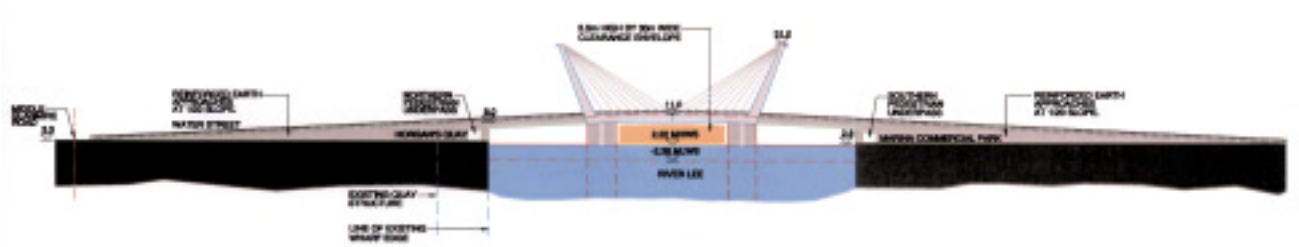


Opening road bridge at Water Street

9.23 The actual form, layout and position of the opening bridge will have to be investigated in more detail subsequent to this study. Among the issues that will require careful consideration are:

- Predicted effects on river traffic movements;
- Predicted effects on road traffic movements, both locally and in the context of the City as a whole;
- Predicted effects on river hydraulics and ecology;
- Aesthetic/visual effects of the new bridge;
- The whole life economics of the bridge;
- Cost implications of the high or low options; and
- Construction issues.

9.24 A comprehensive assessment is thereby assumed to examine the preferred configuration and operation of the new bridge, in conjunction with the appraisal of environmental impacts and river conditions.



Elevation of opening road bridge

Ground Conditions

Geotechnics and Foundations

9.25 The geological profile for Cork City is described in "Geology of East Cork-Waterford" published by the Geological Survey of Ireland. Cork City is underlain by a sequence of bedded carboniferous sediments. The sequence consists of mudstones, sandstones, shales and limestones dipping steeply to the south. The study area to the north of the river generally consists of flaser bedded sandstone and mudstone of the cusking member of the Kinsale formation. The remainder of the study area consists of a combination of fossilferous dark grey limestones and massive unbedded lime mudstone.

9.26 The surficial soils overlying the bedrock are highly variable consisting of alluvial floodplain deposits and residual soils derived from weathering of the underlying bedrock.

9.27 Borehole results from the Cork Main Drainage site investigation were made available to the study team. In general the borehole logs indicate that the ground within the study area consists of one to two metres of made ground over predominantly sands and gravels with some silts, clays and peat. Within the central island and close to the river, estuarine deposits in excess of 40 metres in depth were detected.

9.28 Visible evidence of rock at the surface is the sandstone escarpment running east-west immediately north of the railway at Tivoli and the limestone blackrock escarpment along the southern edge of the study area.

9.29 The foundations for any significant structures within the study area would be required to be supported on piles. The surficial soils are considered to be unsuitable for supporting foundations to anything other than very lightweight structures.

Contamination and Reclamation

9.30 Historical maps of the study area were sourced to facilitate a desk study regarding potential ground contamination issues (WS Atkins Wastes and Contaminated Land Department undertook). A detailed review of contamination issues in the study area. The findings of this work are presented below.

Preliminary Comments on Ground Contamination Implications

9.31 This study area presents many examples of previous (and current) uses that are likely to have left a contamination legacy requiring actions. Such actions could be in the form of 'amended' land uses or the use of environmental engineering techniques to address the hazards and, subsequently, the use of risk management systems to overcome any residual contamination. In some cases, the contamination might have only a modest impact on development options, the most sensitive of which, in this situation, are amenity and residential. However, in this latter regard, due distinctions need to be drawn between flats or 'town houses' with no gardens, and those with gardens where the risk of human interaction with any contamination can be profoundly different.

Assessment methodology

9.32 This preliminary assessment is based a review of map-based data on current and previous uses within the study area (and its immediate surroundings), and the development of hypotheses regarding the likely nature and scale of contaminants in the ground, the very large majority of which has been reclaimed from the original river/tidal zones. These hypotheses are possible because there is usually a strong correlation between:(i) former uses, the period of operation and their duration, and (ii) the presence of contamination. Based on these hypotheses a series of conceptual models were generated that attempted to link the potential hazards with potential receptors through pathways that may be soil borne, water borne or air borne.

Principal potential contamination sources

9.33 Based on the available historical maps, the following are the principal industrial uses noted. Clearly there will be other, principally smaller scale, uses that will also be of relevance but these are unlikely to be of fundamental importance at this stage. Also, even the most benign industries (eg, bakeries and corn stores) can be expected to have had fuel oils and other chemicals that, if not effectively managed, could have left hot-spots that would require specific actions in due course:

- hydrocarbon fuel storage;
- fertiliser manufacture;
- timber treatment;
- vehicle manufacture, servicing and repair;
- tyre manufacture; and
- dock/port works (construction, repairs, servicing and shipbreaking etc).

9.34 These uses, many of which have been pursued for many decades, can be expected to have left some scale of ground contamination. Some of the principal chemicals that can be associated with these uses are listed later in this section.

9.35 Clearly, coal stockpiles can have a contaminative effect, not least in terms of residual combustible material. However, at this level of evaluation it is unlikely that such uses would represent development constraints. Indeed, that particular use could have created a very particular benefit, namely the consolidation of the underlying ground, most of which was formerly mud-flats/estuarine and so would be subject to long term settlement.

Principal industries and zones of relevance

9.36 In terms of potential risks to both redevelopment and the wider natural environment (especially water bodies), the principal contamination sources identified (in terms of their scale and nature) are probably centred on the two zones of fuel/oil storage adjacent to Monahan's Road. It is no doubt inevitable that these zones will represent a considerable proportion of the sites that have been contaminated to relatively high degrees, not least due to the ease with which oils will migrate, i.e. while the original sources of such contamination may be relatively modest, the effects can be much more widespread where the light hydrocarbons have 'pancaked' on top of the undoubtedly high water table. The lateral migration potential of this contamination can be considered high, not simply because of its inherent nature, but also because of the probable high permeability of the shallow ground mass. This was probably formed with a mixture of reclamation materials that were acquired locally, possibly even including some dredgings from the river.

9.37 Fortunately, these 'high risk' zones are not immediately adjacent to the river but since the natural hydraulic gradient is in that direction, some offsite migration should be assumed at this stage.

9.38 The next most significant former usage could be the actual, or potential, timber treatment works (listed as Creosote works and Timber Yard for example). These areas could present significant conflicts, albeit the areas of relevance may be of modest proportions.

9.39 The gasworks is outside the study area, except for some gas holders. Thus, the worst effects of such facilities are not likely to be manifest.

9.40 The land associated with railway activities, both the active area around Kent Station and in the two former stations to the south of the river, is unlikely to present profound redevelopment difficulties, at least in comparison with several other former uses. Nonetheless, there is likely to both a general level of contamination from diesel oils and ash, for example, and also some 'hot-spots' associated with workshops and waste disposal areas. The two older stations to the south of the river are less likely to have oil contamination but could have high heavy metal content from the ash residues. Much of this may have already gone in the subsequent reuse of these areas.

9.41 The other industries can be assumed to have general low-level contamination and some localised hot-spots.

Physical ground conditions

9.42 As indicated earlier, the physical ground conditions can be relevant to both the contamination and the actual redevelopment operations. Massive foundations and old underground infrastructure can present greater complications than some contamination, as well as compromising the ease with which contamination might be treatable. This condition can be further exacerbated where there has been a succession of uses with different foundations.

9.43 Regarding foundations, it is assumed that any building of reasonable substance has been oiled because of the (assumed sift alluvial) strata underlying the large majority of the study area.

9.44 A further aspect of the physical ground conditions is that of silts (such as in in-filled docks like that to the east of Kent Station) which can be both soft and also have a residual organic content that can release methane, albeit probably at slow rates. Such methane generation could also be possible in other areas filled with organic materials. Obviously, any areas that were subject to the disposal of biodegradable wastes can be assumed to be gas-active unless measurement data prove otherwise.

9.45 A further facet of this aspect is that of the integrity of the river wall in terms of its current or continued ability to provide protection against the migration of contamination into the river. This long-term integrity will probably be a significant issue, that is if there is significant contamination behind the walls.

9.46 The areas where the remediation options are most predictable are the sites associated with hydrocarbon fuels. There is a well-established suite of technologies, both in situ and on-site ex situ, for addressing this type of contamination. In this instance, it could be assumed that the achievable remediation standards would not cause a fundamental restraint on future use options. However, the timescales for achieving these standards might not always match the redevelopment programmes, although, on a strategic action plan such as this, such programmes can probably be accommodated.

Outline of the principal potential contaminants

9.47 Generally the most significant contaminants are those that are mobile or soluble. Thus materials such as fuel oils can be viewed quite differently from many solid wastes that can be high in heavy metals. While they can both be very relevant, the latter can become much less relevant with less sensitive uses, such as 'hard' developments like office and the like.

9.48 It can assume that all industrial sites may have had repair/servicing shops and invariably this will have involved chlorinated solvents used as cleaning agents, for example. Similarly, on site electrical transformers can be assumed to have had PCB dielectrics in the past. If not managed effectively, such compounds can have very costly implications. However, for some plants these can be relatively minor scale activities and might be unlikely to cause significant impacts at the strategic level. Accordingly, the outline below is generally aimed at the likely more dominant and particular contaminants associated with the listed industries.

9.49 What each industry may have in common is an on-site zone for waste disposal. This may have been a 'glory hole' into which modest volumes of oils and the like may have been discarded over several years. In aggregation the effect could be significant in that area.

9.50 Principal industries noted in study area are:

Hydrocarbon fuel storage

9.51 Virtually the whole series of these activities on such sites can be relevant to ground contamination from the range of products handled during the life of the facility; e.g. importing operations, storage and distribution. In this regard, the principal features of interest are tanks, pipelines and the like, each of which can have contributed to leaks and spills.

Vehicle service and repair

9.52 Although usually relatively modest in scale, such operations can have a disproportionate effect on contamination, especially where there has been poor site management. In addition to normal hydrocarbons, chlorinated solvents can also be expected.

Fertiliser manufacture

- Nitrogen fertiliser: Ammonia and Sodium Nitrate (Chile saltpetre) (Ammonia possibly from local gasworks, or imported ammonium nitrate + nitric acid);
- Phosphate fertiliser: Acid (sulphuric)+ Phosphate rock;
- power generation activities; and
- water purification processes.

Timber treatment

9.53 Some timber treatment works might be quite benign and may have been only associated with sawing and the like. This cannot, however, be assumed without evidence in corroboration. Accordingly, some very toxic compounds can be present and which would be viewed as significant risks to both redevelopment and the natural environment. Some of the preservatives of relevance include:

- Creosote (including PAHs and phenols);
- CCA (copper-chromium-arsenic) solutions;
- light organic solvent solutions (e.g. lindane, organo-tin, PCPs, dieldrin, white spirit, kerosene, and petroleum distillates).

Vehicle manufacture

9.54 These facilities can vary greatly in the nature and scale of potential contamination.

9.55 Large proportions of the sites in question can be quite benign since they may have been associated with 'dry' processes and activities. However, other areas are less likely to be benign. These include areas where the following activities occurred:

- welding and soldering;
- paint shops;
- fuels storage and usage;
- servicing/plant repair areas; and
- waste disposal areas.

Railway land and engineering works

9.56 Such uses can leave a wide range of hazardous materials, albeit in concentrated areas. One of the most significant can be asbestos, which was particularly associated with the breaking of carriages and engines. In addition, 'normal' fuel oils, acids and solvents can be expected, especially since the 1950's with the introduction of diesel power. Ash, which would have relatively high heavy metal concentrations, would also be prevalent on parts of the site.

Tyre manufacture

9.57 The actual range of contaminants will depend on the processes used in this instance. In any event it is assumed that phenols, solvents and sulphur compounds could be of particular relevance. Again, it is where these materials were in liquid or similar form that the most likely effects occur.

Dock/Port activities

9.58 These facilities can leave legacies similar to railway land.

Environmental Management

9.59 The redevelopment of any urban area can be significantly affected by ground contamination caused by previous industrial uses of land, whether because of direct effects on the development features and land uses (in terms of creating "fit-for-purpose" conditions) or because of environmental liabilities associated with the ground contamination. While most older industrial sites are contaminated to some degree, the scale is such that specific environmental protection measures are not often essential. However, it is usual for the Environmental Protection Agency to take the opportunity of stipulating the execution of any remediation works that would provide long-term protection of the environment, as part of the redevelopment process. The outcome of the assessment of the implications of ground contamination is the formation of judgements on the likely significance of existing conditions on each 'plot' vis-à-vis proposed or potential future uses.

9.60 In simple terms, any proposed uses that are generally similar to those already existing can, in the first instance at least, be considered compatible with ground conditions. However, that could be a false assumption if the scale of contamination was high, or where the previous use may have been approved, say in the 1970-80s, when the appreciation of ground contamination and environmental awareness was lower than recently. On the other hand, achieving a 'fit-for-purpose' development can be assumed to be easier for industrial and commercial uses than it is for residential, amenity and recreational purposes. As far as roads and infrastructure are concerned, it can also be relatively straightforward to achieve the necessary level of risk management. That said, new infrastructure trenchlines could become a route for contamination migration, especially where, for example, surface water drainage is directly into the river.

9.61 Unless there is a strategic remediation plan then economies of scale associated with individual sites could restrict the use of some common features such as soils washing and materials recycling. Experiences developed from the remediation of contaminated sites in Europe highlight the advantages of approaching this issue with a risk management philosophy. This can bring the value of sustainablility of development. However, it is inevitable that some contamination can only be addressed by excavation. In this regard the scarcity of suitable disposal options in Ireland can make this difficult and so it might be appropriate to consider some on-site encapsulation, an option that would require serious negotiation with the EPA.

9.62 Further more detailed studies will be required to develop the issues of ground contamination assessment and potential suitable sustainable remediation techniques raised above.

Infrastructure Capacity

9.63 Most of the major service providers have infrastructure within the study area. Consultation meetings have revealed that south of the river almost all utility providers have services running beneath the carriageway and footways of Centre Park Road.

9.64 The congested conditions regarding utilities along Centre Park Road is compounded by the presence of a number of strategic services. The ESB has two sets of twin 110 kVA main supply cables in this area. ESAT has a strategic fibre optic supply along Centre Park Road. Services of this nature require considerable care during hand excavation and exclusion limits are usually imposed by the particular service owners within which no other service operator can impinge. The existing congestion and the presence of large mature trees, combined with the difficulties associated with the strategic nature of a number of the services already present in the area will have implications on the development of a dedicated services corridor along Centre Park Road.

9.65 The strategic services included within the study area include:

The Main Bord Gais (BG) Transmission Line (70 bar)

9.66 This is the main strategic natural gas supply pipeline bringing natural gas from the Kinsale gas field to the west of the city. It runs alongside the Marina Road and down Centre Park Road as far as the BG Above Ground Installation (AGI) opposite the Marina electricity generating station. This route is being considered for a dedicated public transport corridor between Mahon and the city centre. BG have a code of practice regarding safety precautions and other conditions affecting the design, construction and maintenance of services in the vicinity of gas transmission lines. The main effects of this code of practice are as follows:

- prior formal consent of BG prior to undertaking any work within the transmission main wayleave.
- the promoters of the works are required to indemnify BG against all damage to their infrastructure as a result of the works etc.
- "As a general rule", no new service is to be laid within the BG wayleave parallel to the gas main.
- cathodic protection interaction tests are required to investigate the effects of any new service on the gas main cathodic protection system.
- mechanical excavation is not permitted within 3 m. of a gas main. Hand tools are not allowed within 1.5 m.

Strategic Electricity Supply Cables

9.67 Two 110 kVA main electricity supply cables cross beneath Centre Park Road at the ESB generating station entrance. An additional 110kVA cable runs along and beneath Centre Park Road towards the City Centre. These are strategic electricity supply services. Accordingly the ESB will require that any works that are undertaken immediately adjacent to these services are supervised by their own staff. Whilst we do not foresee a requirement to relocate these services as a result of the current proposed infrastructure layout we would point out that relocation of these cables is costly.

ESAT Communication Cables

9.68 The comments made above regarding the 110 kVA services running along Centre Park Road are also relevant to an ESAT fibre optic cable which follows a similar route.

9.69 The proposals to include new access roads running parallel to Centre Park Road and outside the lines of the existing trees would require the relocation of a number of local above ground service installations. A full survey of the installations that would be affected has been carried out. This has identified a number of issues including a requirement to extend the overhead gantry that crosses Centre Park Road and supports the oil lines running between the south bank of the river at the Marina Commercial Park and the Shell supply depot.

9.70 Consultation with the various utility providers has indicated that, other than the inadequacy of the surface water drainage system highlighted in a previous section of this report, the existing and proposed capacities for electricity supply, foul sewerage, telecommunications, gas, and water do not pose a significant impediment to the development of this area of the city.

The issue of this area of the city being developed as a 'Teleservices Centre of Excellence' and the consequent requirements for state of the art broadband communications infrastructure is a matter for further detailed study.

Strategic overview

ESB

9.71 The electricity network infrastructure consists of the transmission system which transfers bulk power from the power stations to large load centres, and the distribution system, which delivers the power to end users.

9.72 The bulk of the ESB network was constructed in the era of rural electrification which ended in the mid 1970s. Since then ongoing reinforcement and expansion of the network has continued to cater for growth and the connection of new loads. The exceptionally high level of economic activity in recent years has caused the level of investment to be stepped up considerably. In parallel with this period of rapid growth, ESB have embarked on a programme of network renewal designed to deliver a higher quality of electricity supply. Since 1995, they have invested £900m in the networks and we are informed that this will be significantly accelerated in the period to 2005 with an investment of £2.1bn-£1.6bn on renewal and expansion of the distribution network and £500m on upgrading the transmission network. This level of investment is to be continued in the following five years so that by 2010 the original network will have been effectively replaced.

9.73 A feasibility study of an interconnector between Wales and Ireland is being undertaken by the UK National Grid Company. Should such a link become established it will be a very significant development in terms of capacity and power trading on this island. It will also have a positive impact on the realisation of wind potential in Ireland.

9.74 The Irish electricity system is as modern as in any developed economy. Exceptionally high growth rates in recent years and a move away from central planning in both generation and transmission have undoubtedly stretched the supply/demand balance. Our information is that the generation dimension will be significantly improved within six months. Significant strengthening of the transmission system is underway with £500m being invested over the next five years.

9.75 The ESB is undertaking an ambitious programme of investment on network renewal and expansion that should deliver a high quality, reliable and efficient transmission and distribution infrastructure across Ireland. They are prepared to work closely with Eirgrid, IDA and other key stakeholders to ensure that the transmission and distribution networks will be capable of sustaining economic development and supporting continuing population growth throughout the country.

9.76 Generation capacity additions at an average rate of 200MW per year are required on the basis of current projections. There are a number of technology options available to meet these requirements. There are constraints associated with each, e.g. gas and dependency, coal and emissions, wind and load factor, fuel cells and commerciality, undersea interconnection and capital cost. Whichever option is chosen at the time will be heavily influenced by the market environment.

9.77 Currently there is a deficit of electricity transmission infrastructure in Ireland. A programme is in place to rectify this shortfall over the next 5 years. The deficit is most acute in the West of the country and much of the transmission investment is aimed at improving this situation. There are barriers in the way of successful completion of the programme. The most significant continues to arise from local objections which, under the current planning framework, lead to lengthy decision timelines.

Gas

9.78 Most of the gas used in Ireland is purchased and imported directly by other parties, with Bord Gáis simply providing the transmission lines, subject to Government regulation.

9.79 The main suppliers to the market are Russia, Norway and Algeria. A review of proven world gas reserves, shows there are ample gas supplies available to Europe, however future supplies will have to travel longer distances than heretofore. less than 3 million km in 1980 to 5.5 m km at present. In Ireland the transmission network has been developed on a phased basis on the back of rising demand and has become a driver for further development bringing with it additional users and some element of self generating demand. The UK is becoming the most important source of Irish gas supplies, a trend that has been accelerated by the depletion of the Kinsale head field. The Bacton interconnector has had a strong impact on the UK gas market and whereas the spot prices in the UK and at Zeebrugge have converged, the link with oil has re-emerged, linking the volatility of that market with natural gas.

9.80 Last year 70% of Irish supplies came from the UK and the Irish market is now an integral part of that market. All natural gas imports into the Irish republic are presently transported via a single interconnector linking North County Dublin and South West Scotland. Despite expanding that pipeline to its peak capacity, it has became apparent that the existing gas infrastructuure would not be able to meet peak demand by winter of 2002 /03.

9.81 Cork, arising from its proximity to the Kinsale head field, has an extensive natural gas infrastructure and a high demand base from local industry. The rationale for the proposed Ringmain connecting Dublin, Galway, Limerick and Cork arose from the dual requirements of bringing additional supplies to the high demand centre in the South—as Kinsale reaches depletion—and the desireability of opening up the midlands and west of Ireland to natural gas.

9.82 Whereas additional indigenous supplies from the Corrib field in Galway would alleviate supply shortages for a time, Corrib gas will not reach market in advance of peak winter requirements in 2002/03.

9.83 The next few years will see major developments in the Gas transmission network. The completion of the Ringmain, of the Mayo Galway pipeline - connecting Corrib gas to the national grid - and of a new interconnector gas pipeline between the UK and Ireland will result in a doubling of Ireland's transmission infrastructure by year end 2002. In addition there is an application in for the construction of a South North pipeline supplying natural gas to a new powerstation at Coolkeeragh in Derry.