Sub No. 9

ENVIRONMENTAL PROTECTION AGENCY
09 FEB 2005

Our Ref: 04-025-050203-01L

Brian Coyle
Block 1
GFSC
Moneenageisha Road
Galway

Date: 3rd February 2005

Environmental Protection Agency
IPC Licensing
Received
- 9 FEB 2005
Initials

The Secretary
Environmental Protection Agency
PO Box 3000
Johnstown Castle Estate
Co. Wexford

Re: Corrib Gas Field Development Application for Licence

Dear Sir or Madam:

I am a Chartered Structural and Civil Engineer currently residing and working in Galway and director of Coyle Kennedy Ltd.

I am fully aware of the necessity for the need of proper sustainable development and it is in this regard that I object to the proposed licence sought for the Corrib Gas Field Refinery/Terminal Development in its proposed location at Bellanaboy, Co. Mayo. I beg you to refer to the submissions made during the planning process. A copy of my submissions is included for your information.

My main and primary concern is for the safety of people especially in the Erris community and more specifically adjacent to all development associated with this project (i.e. the refinery, pipelines, landfall, outfall pipeline, upstream pipeline, down stream pipe etc). Many EU Directives relating to the safety and protection of people and hence the environment are constantly updated arising from accidents and incidents that occur. This development as proposed is a major accident waiting to happen unless serious action is taken and the project constructed on an alternative site. The entire scheme as proposed does not constitute the '*Best Available Technology*' and/or solution to avoid pollution. The applicant has ruled out alternative sites on their own merits mainly due to financial considerations during a year when they made a profit of c. 14billion euro.

All Emissions and Waste from this industrial development to land, water and air, during construction, operational and major accident stages must be seriously considered, controlled and modified. Carrowmore Lake has become contaminated in a period when extensive investigation work was carried out on site. Full and conclusive evidence of the source of this pollution / contamination should be identified first before a licence for the development is issued. If we cannot determine the source of pollution now, how does the EPA intend to determine it in the future. There are extremely high levels of phosphorus contained within the saturated blanket bog (90% acidic water).

The Seveso Directive defines that the presence of a dangerous substance under the directive is the 'actual' of 'anticipated' presence of a substance. It is imperative that the treatment of gas containing hydrogen sulphide be considered. It is not good enough to delay such examination. The HSA has already been incompetent in doing so. The applicant has suggested that water in a gas field produces hydrogen sulphide. In the first application P 00/2934 it is quoted that the incoming gas contains condensed water.
This biogas is as likely to be present in a gas field as not and recently it has been found in/adjacent to the 'rivers gas field' in the Irish sea.
In a publication '*Environmental Impact of the Offshore Oil and Gas Industry by Stanislav Patin'* states that

> *the chemical composition of natural gas is rather changeable. However, in all cases it chiefly consists of methane (up to 97%) and methane homologues, as well as inorganic gases such as carbon oxide, hydrogen sulfide, nitrogen and others'*

It is beyond belief that a development of such a magnitude industrial and chemical process has to be sited in an inland site surrounded with unstable blanket bog, adjacent to a residential community, adjacent to a river that directly discharges to Carrowmore lake, at the foot of Dooncartoon Hill where 40 separate landslides occurred with a high pressure upstream and downstream pipeline that is proposed to transverse across private bog land, when there are other options available to the applicant that eliminates all the above. This development does not comprise the 'best available technique/solution' or option available to protect man and the environment.

A baseline study should be carried out of the past and current health of people in the area as it is reported in areas where such industrial activities are taken place that serious health issues have occurred arising from similar development even during the operational phases. This is necessary as it is imperative to be able to monitor and prevent the consequential impact of such a development on human health. Contamination of our natural food chain must be avoided.

An independent baseline study of water (ground water, river, streams, carrowmore lake, Broadhaven Bay) air and land including grazing crops, animals and fish should be carried out and be available for comparison purposes. It should be noted that the proposed gas terminal/refinery is sited on an underground aquifer that most likely connects to Carrowmore lake and Sruwaddacon Bay.

The Western Health board including other health board executives throughout the world should be consulted in relation to potential dangerous dose limits and the potential impacts that this development can have on the people and the environment.
Advice from independent experts should be obtained in relation to the long-term impacts (people and environment) that such development at such a location can have. It is imperative to note that the composition and chemical concentration of gas fields vary and change with time. We cannot be totally reliant on the applicant to supply us with all the necessary information regarding the composition of the Corrib gas field. In this regard, I request that independent experienced industrial, environmental and health experts that are familiar and have monitored similar developments throughout the world be consulted before decisions are made.

The chemical composition and chemistry including the quantity of the 'odorant' stored on site to inject odour into the natural gas should be assessed and considered. I would expect that the amount required is based on the output volume of gas.

Serious consideration should be given to the consequences arising from;

- the failure of the upstream and downstream pipeline and the consequential impact on man and the environment

- an explosion occurring at the terminal and how it is intended to protect the streams, rivers and Carrowmore lake. The bunds and catchment area proposed could fail in the event of a major accident.

- emission to the air from the 'flare/flume' stack etc, this is certainly not the best available technology.

All preventative measures to protect human life and the environment arising from the construction and operational phases of the refinery process of the Corrib gas field should be implemented and in doing so would effectively indicate that this is truly the wrong location/site for this development. It is not acceptable in such a currently clean local environment that concentrations above the existing levels and approaching the allowable upper limit thresholds should now apply. In doing so implies that contamination and pollution will occur.
The best available technique/solution for the development of the Corrib gas field is not to locate the refinery in one of the worse sites in the country, close and within the catchment area of the only drinking water supply for the entire region surrounded in unstable blanket bog in an area of natural ground instability. In accepting this location means that the EPA are ignoring the BAT requirement.
Without prejudice, I request that EPA personal responsible for decision making in Ireland consult with other Environmental experts that has full knowledge of the operational and the environmental impact that such development has on human life and the surrounding environment. Tunnel vision for the benefit of a multi-national company compounded by local and national policy must be set aside when decisions that affect human life and local communities are made.

I am aware that a report has been prepared by University College Cork titled '*Marine mammal monitoring in the waters of Broadhaven Bay & Northwest Mayo 2001-2002*' and that such report identifies the importance of Broadhaven Bay. The discharge arising from the refining of the corrib gas field should be returned to source as a means of providing a closed loop system. I am also aware that such marine mammals are vigorously protected under EU legislation and that such discharge should not be allowed into Broadhaven Bay.

We should not expect anything less for human life and expect long-term sustainable development for generations to come.

Yours Sincerely

Brian Coyle BE CEng MIEI MIStructE

Encl. Observations and Submissions
Page 222-223 Environmental Impact of the Offshore Oil and Gas Industry- re effects of hydrogen sulfide
Page 248 Environmental Impact of the Offshore Oil and Gas Industry- re composition of natural gas
Report from Dr Alex Rodgers School of Ocean & Earth Science, University of Southampton

The Bellanaboy Bridge Terminal and Corrib Natural Gas Field Environmental Impact Assessments by Enterprise Oil Ireland.

Dr Alex Rogers

School of Ocean & Earth Science, University of Southampton, Southampton Oceanography Centre, European Way, Southampton, SO14 3ZH

Introduction

This report has been carried out at the request of the residents of the area around the proposed development of the Bellanaboy Bridge Terminal. It provides an analysis of the environmental impacts of the Corrib Field gas well development, the pipeline connecting the wells to the mainland and the gas treatment works at Bellanaboy. This analysis is aimed at informing the residents of the Bellanaboy area of the potential impacts of this development on their local environment and quality of life. This is necessary because of the density and technical nature of the Environmental Statements that have been produced by Enterprise Oil concerning this development. These statements are produced in two large volumes and relevant information is scattered throughout both texts. While these are suitable for examination by scientists and politicians familiar with such developments they do not present an accessible form of information of members of the public. This report is neither aimed at criticising the Irish government's policy of hydrocarbon exploration nor Enterprise oil. It is a specific treatment of the Bellanaboy Development and its impacts on the Bellmullett area and its residents.

My own area of expertise is as a marine biologist with 15 years of experience. I have particular interests in deep-sea biology and thus on the impacts of hydrocarbon exploration and production on deep-sea animal communities. I have acted as an expert witness on these matters for Greenpeace vs the U.K. Government and 10 oil companies in a judicial review at the High Court in London. This case was successful in having the European Habitats Directive applied to the edge of the continental slope in U.K. waters. I am also familiar with the West Coast of Ireland, and have visited it many times. I am therefore fully aware of the richness of marine life that inhabits this coast.

The Offshore Development

Summary

1. The Corrib gas field represents a substantial reserve of natural gas.
2. The macrofaunal data analysis for the seabed samples from the Corrib gas field is very poor principally because statistical analysis was not adequately described.
3. Examination of the species list indicates that pollution indicator species occur in some of the core samples. This indicates that drilling in this area has probably already caused substantial pollution.
4. This pollution has probably arisen from drill cuttings contaminated with drilling fluids. This has caused smothering of marine organisms and organic enrichment. Chemicals in the drilling fluids may have also had toxic effects on animals in the vicinity of wells.
5. Deep-sea fishing in this area has probably already had a significant impact on the deep-sea benthic fauna.

The Corrib gas field contains up to 1TCF of what is described as "a dry 'sweet' gas" (Enterprise, 2000a). The field is located in approximately 350m depth of water (Enterprise, 2000a p10-1) and is approximately 90km offshore. The Corrib field is therefore located on the upper reaches of the continental slope. The seabed in this area

is described as being "irregular, characterised by numerous ridges and depressions" and would appear to be covered in a thin layer of sand overlying sandy clay (Enterprise, 2000a p11-1). Iceberg plough marks are a feature of this area, though most have been buried and pockmarks have been recorded. Iceberg plough marks are furrows created by icebergs during the last ice age and pockmarks are low relief craters caused by fluid escape from the sediments making up the slope.

27 sites around the Corrib field were cored for analysis of macrofauna (small animals such as worms and small clams (Enterprise, 2000a 12-1). The cores were replicated 2 or 3 times at each site. The data is presented in appendix 12.1 along with estimates of species diversity, richness and evenness of samples. These estimates are virtually useless as they do not provide details of data transformation, diversity indexes used etc. In other words methods for univariate statistics are not presented. The report simply refers to this data by saying that 265 species of animals were identified and that many of these were new to the Irish fauna. A few comments are made on some of these species, particularly cnidarians (sea anemones, jellyfish, sea pens, corals), polychaete worms and echinoderms (urchins, starfish, sea cucumbers). Interestingly a pogonophoran was also sampled, though only a single individual. No other data on the fauna of the Corrib field site is presented. Cluster analysis of the macrofaunal data (Enterprise, 2000a 12-4) reveals that several of the analysed stations appear to form groups based on their similarity. The Statement reports that such clustering may be caused by environmental disturbance caused by drilling. Such a hypothesis would seem to be corroborated by detailed analysis of the species occurrence data. It is particularly notable that several severe pollution indicator species occur in relatively large numbers in some of the sites (see Olsgard and Gray, 1995 for comparison). These include the polychaete worms *Capitella* and *Cirratulus* (see Enterprise, 2000a, Appendix 12.1). *Thyrasira* species are sometimes also linked to severe organic pollution associated with oil wells (Olsgard & Gray, 1995). Comparison with uncontaminated sites using multivariate statistical analysis may reveal the true extent of damage that has already occurred in this area to the macrofaunal community.

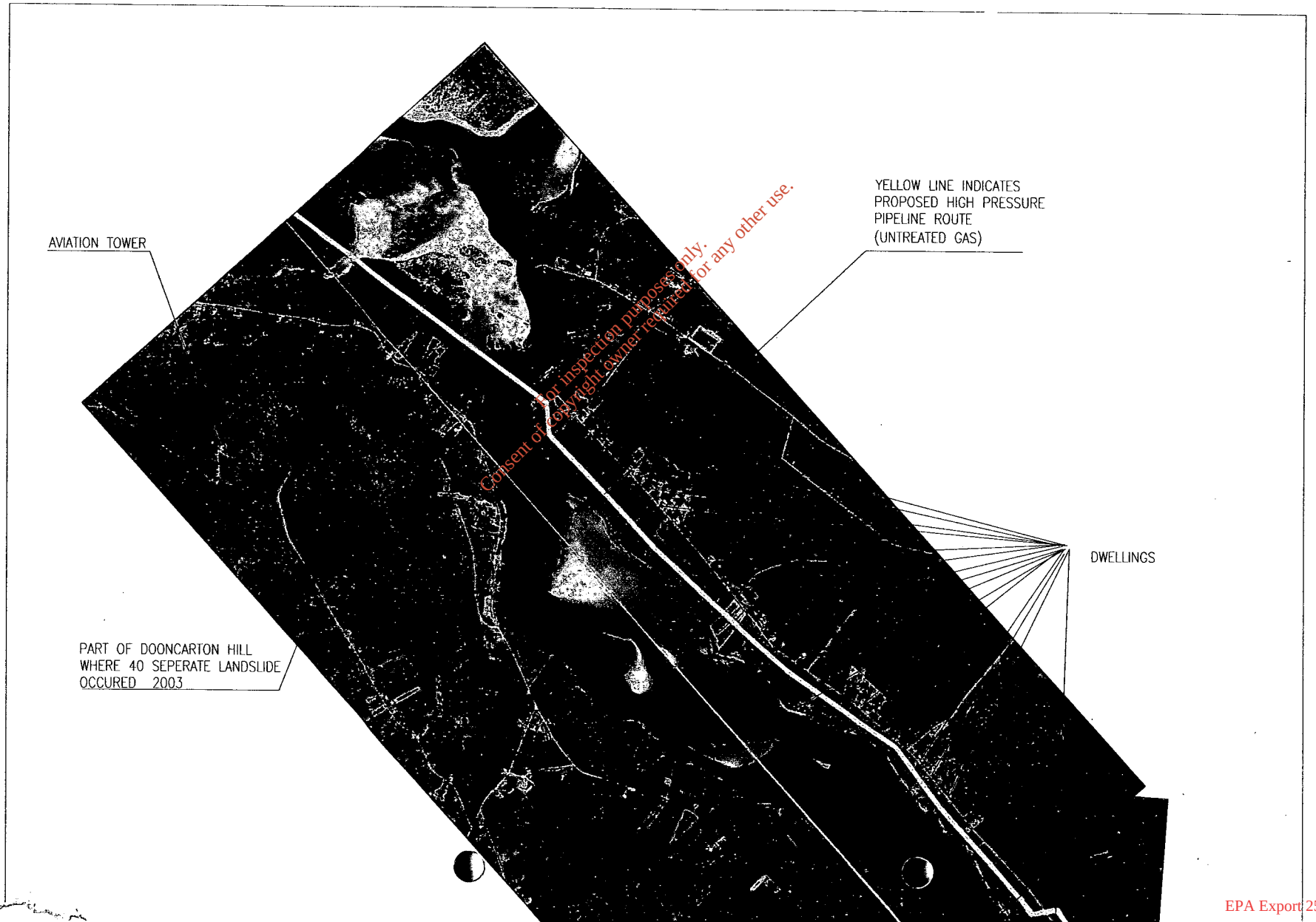
No data is presented in this report in the form of photographs or reports from video transects. There is, therefore, no information on the occurrence of megafauna on the seabed. I view this as a significant omission from the report as information from only a part of the animal community is present. Photographs may also have revealed visible signs of drill-cuttings contamination of the seabed. I am sure that such data is available as the key to Figure 12.1 (Enterprise, 2000a) indicates bottom photographs and the map seems to show that ROVs were used in the area. Core samples do not adequately sample the seabed for megafauna such as the coral *Lophelia pertusa*. This coral has been sampled close to the Corrib field, between 54° 17'N, 11° 33'W - 50° 37'N, 11° 32'W, 394 - 1, 465 m (Stephens, 1909).

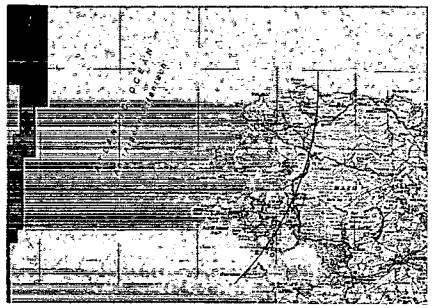
Five exploratory wells have been drilled on the Corrib field (Enterprise, 2000a Table 3.5, P3-10; also Fig 12.1). A single exploration well was drilled in 1996, followed by four appraisal wells (P1-4), 1 in 1998, 1 in 1999 and 2 in 2000. Wells P1-4 will be re-entered and drilling completed and 3 additional wells, P5-7 will be drilled if permission is given. Calculation of the volume and mass of cuttings produced for these wells is difficult. Enterprise data indicates that a total of 2,404 m^3 of drill cuttings were discharged from the boreholes and rigs during drilling of the 5 exploratory / appraisal wells. If 1m^3 of cuttings = 7.5t mass (Scollick, 2000) then this equates to 18,030t of drill cuttings having been discharged into the Corrib Field seabed area. In addition, approximately 6,144 m^3 of water based mud (drilling fluid)

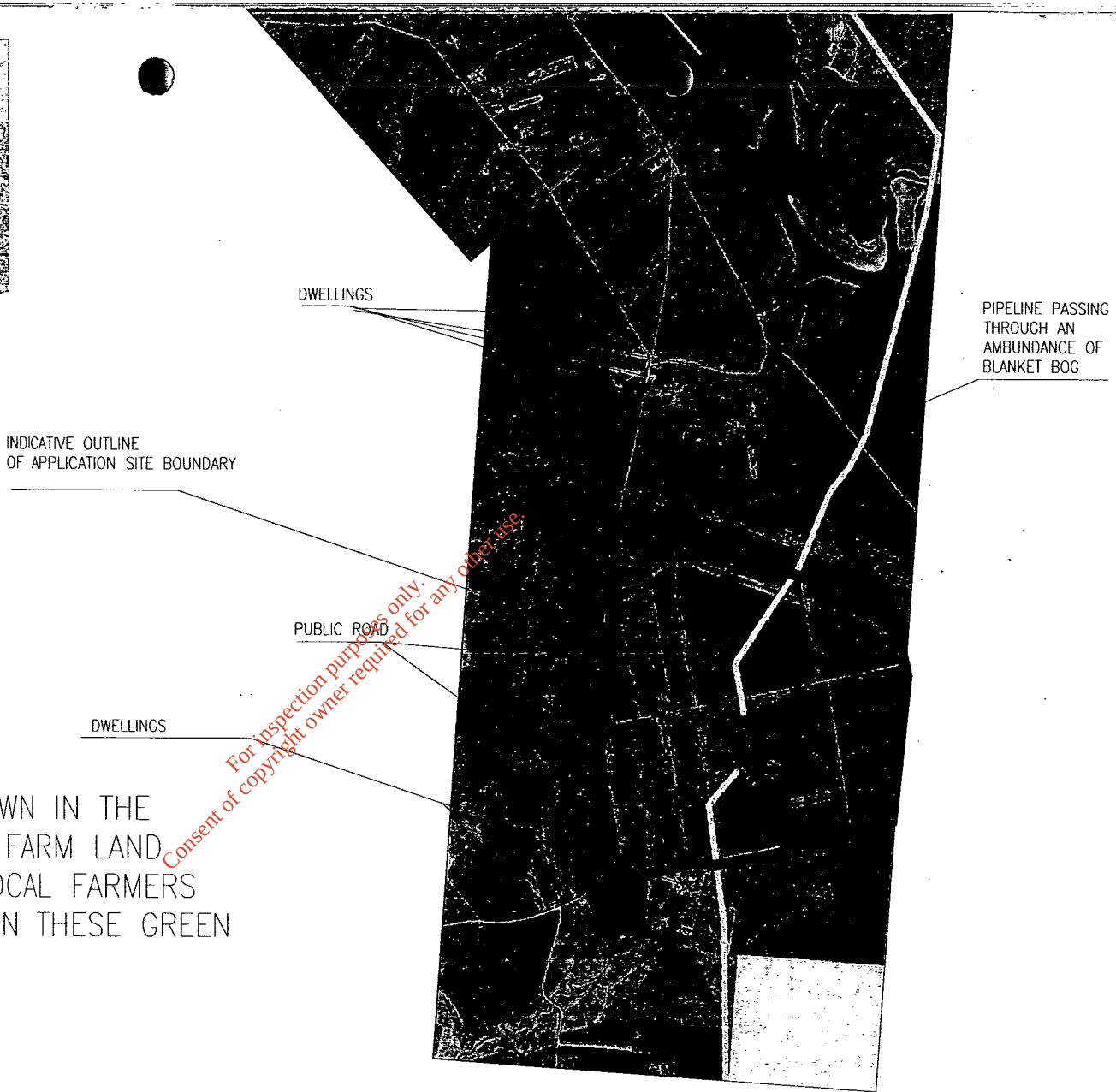
have been discharged and 631t of synthetic based muds. Drilling a further 3 wells will discharge approximately 1,024 m^3 (7,680t at 7.5t / m^3) of cuttings, 377t of synthetic based muds and 1,540t of water based muds (Enterprise, 2000a estimated from Table 8.7 & 8.8). Note these figures are considerably higher than those estimated for An Taisce (Scollick, 2000).

Taken together this represents a very large quantity of material being discharged on to the seabed at the Corrib field. This material is harmful to the marine environment. SBM or synthetic based mud has similar properties to oil based mud except that it is supposed to degrade more quickly in the environment (Enterprise, 2000a 4-2). SBM is used to lubricate the drilling bit during excavation of the well. SBM is returned to the drilling rig where most of it is removed from the drill cuttings using shale shakers. However, approximately 8% of it sticks to the drill cuttings. SBMs will be used for the deeper sections of the Corrib wells and contaminated cuttings have been and will be discharged back into the marine environment via a chute on the drilling rig. This material sinks to the seabed, though some of it will be dispersed during its journey to the seabed (350m depth). SBMs contain materials such as paraffin and various other chemicals (PAO and LAO). This material has contaminated the site around the Corrib wells that have been drilled to date. The EIA indicates that this material was detectable 250m away from the drilling sites (Enterprise, 2000a 16-30), but no details of transects undertaken by Gardline for detection of SBM in marine sediments are presented (i.e. did these transects extend beyond 250m). Indeed, surveys in the North Sea have detected contamination from drill cuttings at distances up to 6km from wells (Olsgard & Gray, 1995). However, such surveys have used $BaSO_4$ to detect the presence of such contamination. The surveys did detect considerable quantities of SBM residues in sediments around the well sites. Levels of paraffin and LAO were reported to have decreased markedly post drilling, the assumption being made that these materials had degraded. I would suggest that an equally plausible suggestion is that some of this material has been dispersed into the surrounding marine environment to cover a wider area. Such a phenomena has been detected around oil wells in the North Sea and is commented on by Scollick (2000). PAOs had not shown a similar decrease in concentration and this has been subsequently removed from SBMs for the drilling of the remaining Corrib wells (Enterprise, 2000a, 16-30). Taken together with the biological data, indicating the presence of pollution indicator species typical of organically enriched sediments, it is clear that the drilling of exploratory wells has significantly damaged this site. I would suggest that drilling of further wells would increase the impact from the disposal of SBM contaminated drill cuttings into the environment. Note that these effects are in addition to the smothering of benthic organisms by drill cuttings and associated drilling muds and other particulate material.

Drilling fluids contain a variety of other chemicals, such as soda ash, to control pH, gelling agent, biocides and large quantities of barite (barium sulphate). Some of these materials are, through their very purpose (e.g. biocides) harmful to marine organisms. Others have been reported to be relatively harmless. Barite is one such substance. However, it must be pointed out that toxicological studies on such chemicals are often only carried out on a limited suite of organisms. As the toxicological properties of chemicals are often largely dependant on the specific organisms involved, it is difficult to predict what effects such chemicals may have in the marine environment. Many toxicological tests are also based on lethal dosage and do not take in to account various sublethal effects such as those that may influence the reproductive success of the effected species. This may be illustrated by barite which







NOTE:
THE GREEN FIELDS SHOWN IN THE AERIAL PHOTOGRAPH IS FARM LAND CURRENTLY USED BY LOCAL FARMERS DWELLINGS ARE BUILT ON THESE GREEN FIELDS

AERIAL PHOTO OF LOCAL AREA
INDICATIVE ROUTE FOR UPSTREAM HIGH PRESSURE UNTREATED GAS PIPELINE
Note the Green Fields and Brown Peat that it is passing through. Also note The location of houses from the terminal and High Pressure pipeline (yellow line)

conceivably become designated as an MPA. However, more relevant to the proposed development is the fact that Broadhaven Bay and the Glenamoy Bog complex have already been proposed as SACs. If the EC ratifies these locations as SACs then these sites will become protected under the European Habitats Directive. I strongly suspect that in such a case it will be unlawful to deliberately damage these sites through human activity. Such damage would include the proposed laying of the pipeline from the Corrib field to shore and thence to the Bellanaboy Terminal.

I cannot imagine that Dúchas would designate these areas without good reason. Broad Haven Bay has been designated because of the range of marine habitats it contains (Enterprise, 2000a NTS-5). Glenamoy Bog is a typical coastal Atlantic Bog complex with a number of rare bird species (see below).

The EIA (Enterprise, 2000a) concludes in the non-technical summary that Broad Haven Bay has a low diversity of species in the vicinity of the pipeline land fall (NTS-5). They also conclude that the fauna along the pipeline route from the Corrib Field is not unusual in the context of the Irish Continental Margin.

Environmental analyses of the seabed and benthic fauna from the Corrib Field to the pipeline landfall are presented in the EIAs. Faunal analysis consists of box cores from eight stations running from the Corrib to the coast (Enterprise, 2000a, 12-5). Results presented from these sites are of limited or no value. They are simply used to suggest that the species identified are typical of a number of types of soft-sediment community that are common around Ireland. This maybe the case, but where are the comparative data. I would suggest that comprehensive offshore biological surveys have not been carried out off the west coast of Ireland. Moreover, the type of sampling used for this study will only detect soft sediment macrobenthos. It is not suitable for examination of megabenthos or the fauna and flora found on rocky substrates. Examination of the chapter on geology in the EIA shows a number of benthic habitats that were certainly not sampled and were therefore not included in faunal surveys. These include mound-like features at 352m depth – 185 m depth (KP4.5-KP28.0, Enterprise, 2000a, 11.2). Up to 81m depth a variety of seabed habitats are found including sands, gravels, cobbles and boulders. At this depth (80-70m depth) a large rocky reef is described. Here a relatively narrow sandy gap (100m) passes between 20m high rocks (Enterprise, 2000a, 11-4). This area sounds very interesting biologically. Apparently photographs were taken of the area but they were not placed in the EIA. The seabed in Broadhaven Bay comprises of sand with some patches of gravel and some boulders (Enterprise, 2000a 11-5). The map of the seabed / shore of the landfall of the pipe line in Broad Haven Bay shows that the shallow subtidal seabed consists of a mix of sand, rock outcrops and shelly gravel (Enterprise, 2000a).

Shallow subtidal habitats of Broadhaven Bay are described as having low species numbers and numbers of individuals (Enterprise, 2000a, 12-6). This is not consistent with the mixed habitats shown on the map of the shallow parts of Broad Haven Bay at the pipe landfall and would appear to be a conclusion based on a few core samples of sandy sediments. I would also suggest that the presence of a lobster (*Homarus gammarus*) population in Broadhaven Bay suggests a mixed rock / sand habitat. I suspect that a diver survey of this area using experienced marine biologists would reveal a much richer benthic community with different species inhabiting rocks, sands, gravels and boulders. This would be a simple and relatively inexpensive operation. Expertise for this type of survey certainly exists within Ireland. Note that the EIA indicates that there maybe a need to blast rock on the seabed in the inshore

area prior to flattening it for the pipeline (Enterprise, 2000b, 6-2). This would cause mortality of animals in the vicinity of blasting but the area of effect is unknown.

Intertidal 'surveys' were made on the sandy shores of Broadhaven Bay where the pipeline is proposed to come ashore, as well as along the shores of Sruwaddacon Bay. 5 transects were made in these areas and another made from further south (Enterprise, 2000a, 12-6 – 12-8). These transects consisted of three cores at high, mid and low water. Transect 1 and 2 were on soft sediments and identified few organisms, mainly polychaete worms. The animals identified indicate an estuarine type habitat (T2), which is organically enriched. The occurrence of the species *Manayunkia aestuarina* (Bourne) is particularly indicative of this type of habitat. T3 was a mixed rocky / boulder shore interspersed with stones and sand. It hosted a rich growth of kelps including the upper shore species *Pelvetia canaliculata* (Linnaeus) and *Fucus spiralis* Linnaeus and the mid / low shore species *Ascophyllum nodosum* (Linnaeus) Le Jolis. A few other algae are mentioned (*Enteromorpha* sp, *Cladophora* sp, *Chorda filum* (Linnaeus) Stackhouse). Few animal species are mentioned and these include the flat periwinkle (now *Littorina obtusata* (Linnaeus) or *Littorina mariae* Sacchi and Rastelli), the common crab, *Carcinus maenas* (Linnaeus), sandhoppers, *Gammarus* sp, the barnacle *Semibalanus balanoides* (Linnaeus), the common limpet, *Patella vulgata* Linnaeus and *Arenicola* sp. I know from personal experience, gathered over years of research on intertidal animals and from the preparation of a new photographic guide on marine animals (Gibson et al., in press) that this represents only a fraction of the number of species I would expect to find on such a shore. The description given for the community inhabiting T3 can only be consistent with little more than a cursory examination of this habitat and is therefore almost useless. Shores on T4 and T5 were treated in a similar fashion. I would expect the communities moving from T3 to T5 to show more and more of an estuarine character and this is consistent with the appearance at T5 of *Fucus ceranoides* Linnaeus, a specialist algae, found living in estuaries. An oyster licence is also held for Sruwaddacon Bay.

The survey mentions a few birds including corncrakes and crossbills that inhabit areas around the pipeline and gas refinery. It is instructive to put these species, especially the corncrake (*Crex crex* (Linnaeus)) in to a national and international context. Corncrakes are a globally threatened species, listed on Appendix II of the Bern Convention and Annex I of the EC Birds Directive. In the U.K. the corncrake is protected under Schedule 1 of the WCA and in Ireland it is protected under Schedule 1 of the Wildlife Act, 1976. Corncrakes migrate from tropical and southeast Africa to western Europe as far north and east as Lake Baikal. Their habitats are generally open areas such as meadowland and they feed on insects, other invertebrates and some plants and seeds. In Europe they arrive in the middle of April to May and breed from the middle of May to the end of July. Usually 7-12 eggs are laid and two broods maybe reared in a single season. Juveniles fledge in 34-38 days. The EIA (Enterprise, 2000b i) indicates that construction of the terminal is due to begin in spring 2001 and will last for 18 months. Clearly there is strong potential to interfere with corncrake nesting sites in meadowland along the northern bank of Sruwaddacon Bay. Corncrake habitats, both in Ireland, the rest of Europe and in their wintering grounds in Africa, are under severe threat. Numbers have fallen dramatically and now there are only four areas in Ireland where small populations of these birds are found (as of 1998). One of these areas is the Mullet Peninsula (Cabot, 1999). Given that in parts of Ireland Rural Environment Protection Schemes (ESA equivalent) have been introduced since 1994 for corncrake protection, as well as management prescriptions on Natural Heritage Areas in sites important for corncrakes I find that this matter has not caused more

concern surprising. Given the globally endangered status of this species, the occurrence of any of these birds in the vicinity of the proposed terminal and pipelines is a cause for concern both nationally and internationally and on this basis alone the plans presented in the EIAs should be reconsidered. In addition, rare crossbill nesting sites are also recorded in the vicinity of the terminal itself. Also no consideration was given in the EIA to terrestrial invertebrates or small mammal populations, though comment is passed on the presence of otters, pine martins and red squirrels. These species, particularly pine martins may also be considered to be of conservation importance. The overall impression is of a survey that is superficial and has glossed over the most important conservation issues.

Bellanaboy Bridge Terminal

Socio-Economic and Visual Impacts of the Terminal

(i) The Bellanaboy Terminal will have a significant negative impact on the quality of the landscape in its vicinity.
(ii) The development may have limited economic benefits to the Mayo region; these will be relatively short term.
(iii) Stimulation of further development following the building of the terminal will compound the environmental impact on the area.

There is a strong emphasis in the EIA on the economic benefits of the Bellanaboy gas terminal to the local area. Mayo is described as an area continuing to undergo rural depopulation and an area with a low level of employment growth and economic performance (Enterprise, 2000b, 13-1 – 13-2). It is stated that the building of the terminal will help to contribute to local infrastructure and will encourage further investment in industry and commerce in the area (Enterprise, 2000b, 13-3). The terminal will employ the equivalent of 50 full time staff and up to 500 people will be involved in the building of the terminal and gas line. It is stated that while some of these workers will be brought in from outside, local employment benefits including the use of local workers and sub-contractors will be used. In this context, I must point out that anybody involved in judgement of planning applications in, for example, Mayo County Council, who may potentially benefit from contracts connected with the terminal should have declared their business interests.

The terminal is set in an area of outstanding natural beauty. As stated in the EIA the terminal is "set in an expansive landscape with distant views available in all directions, with views inland to the south dominated by steeply rising hills." The area is "sparsely populated" with a network of minor roads linking small villages (Enterprise, 2000b11-3). The EIA states that "The impact on landscape character is primarily a result of a change in land use, from unmanaged wet grassland and former commercial forestry, to that of a large industrial complex, in an area which has no major industrial areas of any scale, and no significantly sized structures or built up areas." I think this sums up the general impact of the Bellanaboy Terminal very well. Essentially it represents a major industrial complex placed in a completely rural landscape, which, by virtue of its isolation, low population and natural climate, geology and biology contains a number of significant habitats for wildlife and represents a significant part of Ireland's natural heritage. According to the EIA, the

development will be visible from houses 1.6km away (Enterprise, 2000b, 11-7) and probably much further in certain aspects.

Interestingly, the EIA also states "The effects on the economy in terms of absolute income and employment numbers will be relatively small in relation to the scale of the overall proposal" (Enterprise, 2000b, 13-3). Given the statements in the EIA, there can be no doubt that the Bellanaboy Terminal will dramatically change the local environment. Construction will entail a massive disturbance involving up to 500m people over 18 months, along with increased traffic including heavy plant. The legacy will be a large industrial installation that not only has a significant impact on the visual beauty of the area but which will also contribute significantly to environmental degradation. The prospect of stimulation of future industrial development will erode the natural character of this area further. The people of the Bellanaboy area should be allowed to consider the balance between the potential economic benefits and the environmental impacts of the Bellanaboy Terminal and pipeline. For example, it is quite possible that this development will have a long-term negative impact on the tourist industry in this part of Ireland. From an environmental point of view this development maybe regarded as potentially having significant negative impacts at a national and even international level.

Atmospheric Discharges

1. Various gases and particulate materials will be discharged from the Bellanaboy terminal in significant quantities.
2. Some of these gases are known to cause harm to human health when they reach certain concentrations, particularly when they undergo chemical reactions or are adsorbed on to particles.
3. In general it is considered that most of these gases will be sufficiently diluted that they will cause no discernible effect on the health of the local people or environment.
4. Some materials may be considered as a potential risk to human health even though they are produced in small quantities. These include PAHs and mercury.

The principle discharges in to the atmosphere from the Bellanaboy terminal will be carbon dioxide (CO_2), carbon monoxide (CO), oxides of nitrogen (NO_x), sulphur dioxide (SO_2), methane (CH_4) volatile organic compounds (VOCs) and particulate matter (PM). Several of these chemicals are "greenhouse" or "global warming" gases. Whilst these have an effect on global climate, it is only within the remit of this report to consider the impacts of these gases on the health of the local people and environment around the Bellanaboy Terminal. Chemicals which are a cause for concern with relation to human health and local environmental damage include NOx, CO, VOCs, SO_2 and particulates.

NOx usually has a background concentration of approximately 5-100 ppb (10-200 $\mu g\ m^{-3}$) in urban areas and less than 20 ppb in rural areas (Harrison, 1990). Direct effects of exposure to NO_x include irritation to the human respiratory tract and damage to plants. NO_2 plays an important role in the development of photochemical smogs and oxidation to nitric acid can contribute to acid rain (Harrison, 1990). Photochemical reactions in the presence of hydrocarbons (VOCs) can give rise to ozone. Ozone has been implicated in human health problems and can damage plants at concentrations as low as 50 ppb (Harrison, 1990). Worst-case emissions of NO_x

from the Bellanaboy terminal are approximately 101 tonnes per year (Enterprise, 2000b 8-20). Despite the alarming nature of this figure, concentrations of NO_x in the Bellanaboy area are not predicted to exceed European recommendations on exposure limits to humans and in general are far below these limits. It would therefore seem that whilst elevated levels of NO_x may be taken as a decrease in the quality of air around the terminal there is no evidence that this will have a direct impact on human health. Whether concentrations are sufficient to produce harmful concentrations of other chemicals following reactions with additional contaminants in the atmosphere is unknown.

CO can irreversibly bind to haemoglobin in the blood to form relatively stable carboxyhaemoglobin. It is generally recognised as a significant health problem in areas with heavy traffic (Harrison, 1990). However, in the Bellanaboy area I expect this gas to be sufficiently diluted that it will not present a hazard to human health. The plant will produce approximately 85 tonnes per year.

Approximately 48 tonnes per year of VOCs are expected to be released in to the atmosphere from the Bellanaboy plant in a worst-case scenario (Enterprise, 2000b, 8-20). Note that these figures do not include methane, which adds another 225 tonnes per year to the release of hydrocarbons. VOCs contain a mixture of hydrocarbons so that it is very difficult to predict human health effects arising from atmospheric contamination of these chemicals. Some of the constituents of VOCs maybe harmful to human health and include benzene and polynuclear aromatic hydrocarbons (PAHs). Some of these substances (e.g. the PAH benzo (a) pyrene) are known to be actively carcinogenic in experimental animals (Harrison, 1990) and some PAHs can accumulate in tissues. However, concentrations of PAHs, toluene, xylene and benzene are likely to be so low that they are unlikely to be a significant cause for concern. VOCs and methane may react with NO_x to form ozone under certain atmospheric conditions and, as stated above, this may cause human health problems (Harrison, 1990).

The release in to the atmosphere of SO_2 is probably not a concern in itself because of the quantities concerned. However, combined with particulate materials, SO_2 maybe adsorbed and transported into the lower reaches of the respiratory tract causing health problems (Harrison, 1990). It is considered unlikely that these materials will reach harmful concentrations in the vicinity of the Bellanaboy terminal. However, the chemical nature of some particulate material is a cause for concern. It is notable that mercury will be produced in small quantities (130g / year) as an atmospheric emission (Enterprise, 2000b). This material is a cumulative heavy metal and even contact with small quantities may have adverse effects on health.

In total, atmospheric emissions from the Bellanaboy Terminal are considered to represent a low risk to the inhabitants and environment of the area. However, as the behaviour of many of the potentially harmful materials has not been modelled (only NO_x) it is difficult to predict exactly what concentrations chemicals may reach under all climatic conditions. It is certain that atmospheric discharges will degrade the atmosphere locally but I must emphasise again that this may not represent a human health problem. Clearly monitoring of the atmospheric quality and health of local human and plant populations would be important in determination of exact impacts from atmospheric pollutants if any was detectable. However, as with marine pollutants, it is not necessarily low toxicity chemicals produced in large quantities that are a concern. More toxic chemicals produced in low quantities may be a far greater hazard to the people living around the Bellanaboy Terminal.

The Waste Discharge Pipe into Broadhaven Bay

(i) Waste from the discharge pipe from the proposed gas terminal at Bellanaboy is likely to contain heavy metals and other potentially toxic chemicals.

(ii) At present it is impossible to determine the exact biological effects of these discharges. However, mercury is considered as being one of the most significant materials released.

(iii) Concentrations of mercury in the discharge fluid maybe sufficient to kill marine animals, especially invertebrates. There is a possibility of sublethal effects following dilution of discharge fluid in seawater. Bioaccumulation and biomagnification are common features of mercury and other heavy metal contamination.

(iv) Broad Haven Bay is a proposed SAC. If this designation is accepted then there may be legal protection for this site from the proposed development.

Part of the plans for the Bellanaboy Terminal includes a waste discharge pipe that runs 4 km out in to Broad Haven Bay. This discharge pipe will release water from the Corrib wells and will consist of water condensed from the gas and formation water. Condensate consists of most of the effluent and should have low levels of heavy metal contamination including mercury (less that 1ppm but note the 10 $\mu g/m^3$ in gas). However, formation water will potentially have much higher levels of mercury and other metals. Table 8.13 (Enterprise 2000a, 8-16) presents the maximum concentrations and mass of these metals that maybe produced from the well (thought to be most likely in year 18). To summarise:

Element	Average Emissions (Kg/day at year 18)	Average Emissions (t/yr at year 18)	Maximum Emissions (kg/yr at year 18)
Boron	0.76	0.28	2.47
Phosphorus	0.18	0.06	0.61
Chromium	0.02	0.01	0.06
Manganese	0.56	0.20	1.70
Nickel	2.74	1.00	9.55
Copper	0.01	0.01	0.03
Zinc	0.73	0.27	1.50
Arsenic	0.02	0.01	0.06
Selenium	0.02	0.01	0.06
Silver	0.02	0.01	0.06
Cadmium	0.002	0.001	0.01
Mercury	0.52	0.19	1.82
Lead	0.01	0.004	0.03

Some of these compounds have been demonstrated to have toxic effects on marine organisms.

Nickel is a heavy metal that shows a relatively low level of toxicity to marine animals compared to other elements. However, concentrations of 0.1-1mg / l have been shown to cause mortality to crustaceans after a 4-14 day exposure (Crompton, 1997).

Chromium is a potentially toxic heavy metal to fish and invertebrates. Concentrations as low as 13 µg / l have been shown to severely effect growth in fish. Invertebrates are more sensitive to chromium, with crustaceans showing the greatest sensitivity. Toxicity depends on the pH of the fluid in which chromium is present and whether chromium is hexavalent or trivalent. This metal accumulates in organs of animals living in contaminated water (Crompton, 1997).

Selenium is a trace element that maybe beneficial as an essential nutrient. However, some studies have indicated that selenium may have some carcinogenic or toxic properties. Its toxicity to invertebrates largely depends on its chemical form (selenite or selenate) and it has also been shown to effect reproduction (Crompton, 1997).

Copper can be highly toxic to marine animals. The lowest concentrations that have been shown to have adverse effects are around 2µg / l (Crompton, 1997). Mortalities can be caused in fish by concentrations in the order of 100s µg / l but invertebrates are more sensitive, especially juveniles or larvae. Crustaceans are most sensitive to copper toxicity and molluscs the least sensitive. Juvenile clams have showed mortalities at concentrations of 5 µg / l (Crompton, 1997).

Zinc can be lethal to fish in concentrations of 1000s µg/l but can effect growth at concentrations of 100s µg/l (Crompton, 1997). Invertebrates are much more sensitive to zinc and mortalities may occur at concentrations of 70µg / l following a 4 day exposure (Crompton, 1997).

Arsenic is released in to the environment through the use of various pesticides, feed preservatives, and wood preservatives. Its toxicity is largely dependant on the chemical species encountered. Toxic effects are similar to other heavy metals including lead, mercury and cadmium. Arsenic bonds to sulphur and may inhibit the activity of enzyme systems such as pyruvate dehydrogenase (metabolic enzyme). Arsenic has a relatively low toxicity to fish and invertebrates (Crompton, 1997) but is obviously toxic and carcinogenic to humans.

Silver can be toxic to marine animals depending on its chemical state with silver nitrate being most toxic and chloride, iodide, sulphide and thiosulphate being successively less toxic. Adverse effects have been observed in invertebrates in concentrations of less than 10µg / l (Crompton, 1997).

Cadmium is recognised as an extremely important environmental pollutant. It is toxic to humans and animals and in humans it accumulates in the body throughout life, concentrating particularly in the kidneys where it causes irreversible damage. However, little is understood about the effects of sublethal concentrations of cadmium in the marine environment (Crompton, 1997). Bivalve molluscs and hydroids appear to be the most sensitive organisms to acute cadmium toxicity with concentrations of 1-10µg / l causing mortalities in 4-14 day exposures (Crompton, 1997).

Mercury has long been recognised as a toxic contaminant in the marine environment. It can be highly toxic depending on its chemical form and can accumulate in sediments and in the tissues of marine organisms (e.g. Lawrence & Mason, 2001; Chen et al., 2000). Note that this is in sharp contrast to the single reference cited in the

EIA that suggests that bioaccumulation does not occur (Enterprise, 2000b, 14-21). A 30 days exposure of 1µg / l in fish can produce weight reduction and result in poor spawning (Crompton, 1997). 3µg / l of methylmercury chloride causes 88% mortality in fish. However, invertebrates are much more sensitive to mercury with concentrations as low as 0.2µg /l causing mortality (LC_{50}) to crayfish (Crompton, 1997). Natural concentrations in seawater range from 0.002 – 0.078 µg / l (Crompton, 1997).

Lead is not very toxic to marine animals but can effect reproduction at concentrations above 70µg / l following a 40 day exposure.

Many of the contaminants from the discharge pipe are of low concern because of the extremely low concentrations involved. However, mercury remains a significant concern given its extreme toxicity and its tendency to show bioaccumulation or biomagnification. The produced and formation water will be treated following gas extraction to reduce the concentrations of mercury in the discharge to approximately 0.03 mg / l. Such concentrations have been shown to cause mortalities in marine animals including annelid worms, bivalve molluscs, crustaceans, fish, and larval stages of bivalves and crustaceans (Crompton, 1997). Note that such mortalities occur only after 4-14 days exposure. In Broadhaven Bay exposure may occur over tens of years. Further treatment may reduce these concentrations to 0.005 mg/l (Enterprise, 2000b, 7-11). Note also that this is the concentration in the undiluted discharge water. Dilution with seawater would be expected to markedly reduce concentrations of mercury. However, there is the potential that mercury will be bio accumulated by filter feeding molluscs and biomagnified through predation. The possibility that mercury contamination of Broad Haven Bay therefore remains. Whether this will be sufficient to cause sublethal or even lethal effects in marine species are unknown and unpredictable because levels of mercury produced by the terminal and its behaviour once it is released in to the environment is difficult to predict. I would agree to some extent with the EIA statement:

"Marine organisms have the potential to accumulate some of the contaminants which will be discharged from the terminal into Broadhaven Bay. The contaminants will be accumulated at different rates by different types of organism. The rate of accumulation depends upon a number of factors such as concentration of the contaminant in the water or sediment and the organism's food, reproductive state of the organism and the ability of the organism to regulate the concentrations of the contaminant in its body. The fish and shellfish species which are exploited by fishermen in Broadhaven Bay are all predators, and may accumulate contaminants from their food, the surrounding water and sediment." (Enterprise, 2000b, 14-20).

However, I find the following statement unsupportable with the available information.

"The concentrations of metals which may remain in the Bay (which will be orders of magnitude lower than the EQS) should not increase the body metal burdens of any of the species in Broadhaven Bay." (Enterprise, 2000b, 14-20).

Applying the precautionary principle means that potential contamination from mercury and other metallic and non-metallic elements is a cause for serious concern.

In addition, mercury levels in the gas condensate, used to fuel the plant, are below 1ppm but calculations show that concentrations in the heating medium heaters would be above EPA guidelines. Mercury removal equipment should therefore be included for removing mercury from the condensate. Enterprise state that details of this will be in the planning application for an IPC licence. Residents of the Bellanaboy area should seek clarification on this matter. I maybe expected that equipment within the plant may be contaminated with mercury and so would require careful disposal.

The EIA further states (Enterprise, 2000b, 5-7) that further studies are required to:

Determine mercury partitioning between the gas and liquid phases from well tests.

Take and analyse further samples to confirm mercury levels and if possible the species of mercury compounds in the gas.

Determine the concentration of mercury in condensate and export gas as a result of dew pointing

Confirm the applicable Environmental Limit values for mercury emissions.

It is clear that the status of mercury concentrations in gas and produced / formation water are not sufficiently understood to determine the correct method of treatment and accurately predict levels of mercury in discharges in to Broad Haven Bay.

As well as produced and formation water, methanol used in gas recovery to prevent the formation of gas hydrate, may also form part of the discharges in to Broad Haven Bay. It is recovered by distillation but column effluent water contains about 50ppm methanol (Enterprise, 2000b, 4-6). The EIA states that further treatment options for methanol waste were being considered to reduce levels further (Enterprise, 2000b, 7-5). Further on in the report it is estimated that up to 2kg a day of methanol will be released through the discharge pipe (Enterprise, 2000b, 14-21). This obviously equates to a worst-case scenario of 700kg per year of methanol released into Broad Haven Bay along with quantities of corrosion inhibitor and organic compounds from the well fluids. In addition to this an average of up to 6kg a day total organic carbons from drips and spills are discharged from the plant (Enterprise, 2000b, 14-21). Whether this is discharged directly in to the sea (over 2 tonnes per year), or whether it is treated prior to discharge, reducing levels to 15mg / l is not entirely clear, though the latter would seem to be the case (Enterprise, 2000b, 14-21). The additional pollution impacts of these discharges are unknown at present but should be an additional cause for concern amongst the residents of the Broad Haven / Bellanaboy area and require clarification by Enterprise. In addition there is a "coverall" statement that some chemicals used for maintenance may upset water treatment operations causing discharges to exceed recommended limits (Enterprise, 2000b, 7-5).

It must be noted that some chemical contaminants may combine or act synergistically so that the sum of toxic effects is greater than the individual components simply added together. Some chemicals have the potential to act as hormone mimics in marine organisms and can have a dramatic impact on their reproduction. Other sublethal effects may include the disruption of the function of olfactory organs or masking of environmental cues for migration or reproduction.

Migrations of salmon and trout in to the Glenamoy River may be one such area for concern (Enterprise, 2000b, NTS-7).

Summarising all this information the conclusion must be drawn that contamination of Broad Haven Bay with heavy metals and other chemicals is possible and may result in adverse effects to the environment. Given that this is a proposed SAC, designated on the richness of marine habitats it contains, I believe that the building of a pipe line across this area and moreover a discharge pipe releasing a cocktail of chemicals in to the bay is unacceptable. In fact, in view of the European Habitats Directive and views expressed by An Taisce (Scollick, 1999) I find it remarkable that this development has not caused more discussion at a national and European level.

Conclusions

(i) Drilling of exploratory well in the Corrib field has already resulted in environmental damage. This will increase following the drilling of further production wells.

(ii) All environmental surveys carried out in the marine habitat were inadequate.

(iii) The Bellanaboy Terminal, pipeline and discharge pipes all have potential impacts on SACs or proposed SACs. At least one globally threatened species may also be affected by the development.

(iv) The Bellanaboy Terminal will have a dramatic impact on the rural, non-industrialised area of NW Mayo. I view this as having an impact on Ireland's Natural Heritage.

(v) Discharges of gases to the air may have limited impacts on the area and on the health of the residents. They may be viewed as decreasing environmental quality. Production of small amounts of toxic chemicals in air discharges maybe more significant than production of large quantities of greenhouse gases to the local population. Any impact on human health or the environment from gas discharges will be difficult to prove.

(vi) Economic benefits to the local area are small and short-term (20 years).

(vii) I am surprised by the lack of discussion of this development. In particular, I find comments by Dúchas somewhat disappointing in that they have stated that there are no serious objections to plans as long as birds are undisturbed (Enterprise, 2000b, 14-7). However, they have recommended various surveys be done prior to the development. A report by An Taisce (Scollick, 1999) raises serious concerns with regards to the development and impacts on offshore habitats in particular.

(viii) Much of the land around the Bellanaboy Terminal site should be subject to much more rigorous management on a regional and national basis. This is not only in the context of the gas development but also in terms of other forms of land usage (i.e. conservation-friendly farming).

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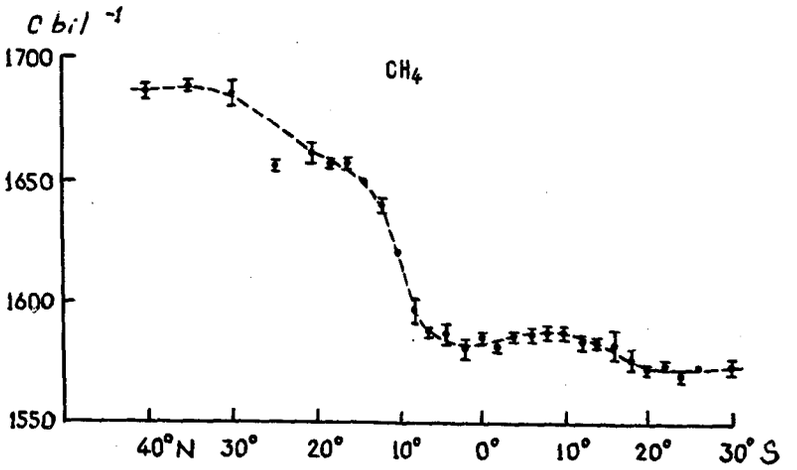

Figure 48 Distribution of methane concentration in the lower part of the troposphere above the Pacific Ocean in 1983 [Koropalov et al., 1988].

because the main anthropogenic sources of their input into the environment are located in the Northern Hemisphere. Many scientists believe that gases released due to human activities have already begun to affect the earth's overall temperature and the methane anthropogenic emission is responsible for about 30% of the total warming effect. If the concentrations of methane and other greenhouse gases in the atmosphere keep increasing, global changes in climatic conditions on the earth will be noticeable in the near future [Masood, 1995; Patin, 1997; Velichko et al., 1997].

The oil and gas activity is one of major anthropogenic sources of gas hydrocarbons. In the United States alone, fugitive emission of methane into the atmosphere from the activity of the gas industry is estimated at 4.4×10^{12} g/year [Beck, 1993] and in Russia—over 14 billion cubic meters a year [VNIIP, 1994]. The volumes and causes of these emissions as well as their distribution can differ in different situations. However, in all cases, the result is mostly air pollution. Hydrocarbons of methane series are not removed from the air masses by precipitation and their water solubility is relatively low.

Another component of natural gas—hydrogen sulfide—is water soluble in contrast with methane. It can cause hazardous pollution situations in both the atmosphere and the water environment. Its proportion in the composition of natural gas and gas condensate, as previously mentioned, sometimes reaches more than 20%. Pollution

by hydrogen sulfide can lead to disturbances in the chemical composition of surface waters. This gas belongs to the group of poisons with acute effects. Its appearance in the atmosphere and hydrosphere can cause serious economic damage and medical problems among local population. Unfortunately, in Russia, air, soil, and water pollution by hydrogen sulfide and sulfur dioxide has been reported in a number of regions. Especially severe consequences for human health and biota have been observed in the basin of the low Volga River in the zone of development of the Astrakhanskoe gas condensate field [Ecology and impact of natural gas on organisms, 1989].

The sources of atmospheric pollution also include flaring of natural gas on the offshore platforms and onland terminals. Some estimates [Cairns, 1992] show that about 10% of total gas production and up to 30% of associated gases are burned here. The behavior and distribution of the products of natural gas flaring in the atmosphere, their removal by precipitation, and the impact on the water environment have not been studied. The same situation is true regarding gas emissions at different stages of its production, transportation, and processing. Some studies indicate that due to the activity of British oil companies on the shelf of the North Sea alone, about 75,000 tons of methane enter the atmosphere every year [Somerville, Shirley, 1992]. In Norway, special studies revealed that fugitive hydrocarbon emissions are equivalent to approximately 0.02% of the total gas produced in 1992 on the Norwegian continental shelf [Christensen, 1994]. However, any estimates about the possible influence of natural gas emission from the offshore oil and gas activity on atmospheric processes and global warming are absent thus far.

An important anthropogenic source of gas hydrocarbons in the water environment is the offshore drilling accidents. Their environmental consequences can be very hazardous. Especially dramatic situations developed in the Sea of Asov as a result of two large accidents on drilling rigs in the summer-autumn of 1982 and 1985. These accidents caused long-term releases of large amounts of natural gas into the water accompanied by self-inflaming of the gas. During these events, the levels of methane in surface waters exceeded the background concentrations up to 10–100 times. The air samples also showed very high concentrations of methane. These accidents drastically disturbed the composition and biomass of the water fauna and caused mass mortality of many organisms, including fish and benthic mollusks [AzNIIRKH, 1986; GLAVRYBVOD, 1983; 1986]. Similar incidents probably took place in other regions of the world as well. However, there are no publications on this topic available.

application factor of 0.01 gives an approximate value of MPC for dissolved methane of about 0.01 ml/l. The same figure was found previously based on biogeochemical data and considerations.

The same result of two independent estimates certainly increases the reliability of the final assessment. However, it does not exclude the need for its correction with new data. In any case, the concentrations of methane in surface waters of the World Ocean are significantly (2–3 orders of magnitude) lower than the acceptable levels that are established using toxicological and ecological criteria (see Figure 53).

The combined biogeochemical and ecotoxicological materials given above may be used for environmental impact assessments during the development of the offshore oil and gas fields. They could also be helpful for environmental monitoring and predicting the consequences in case of accidental and routine gas emissions in areas of offshore platforms and underwater pipelines. The general methodology of such monitoring and prognoses is based on the notion of ecological assimilation capacity of water bodies and the acceptance of a controlled impact on them [GESAMP, 1986; Lavrick et al., 1991; Zaidiner, 1993].

Conclusions

1. The chemical composition of natural gas is rather changeable. However, in all cases, it chiefly consists of methane (up to 97%) and methane homologues, as well as inorganic gases such as carbon oxide, hydrogen sulfide, nitrogen, and others.

2. Over the last 100 years, the natural process of methane production and distribution in the biosphere has become the subject of large-scale anthropogenic impact. Already, this has noticeably increased methane concentration in the atmosphere (more than a two-fold increase since the beginning of the century), especially in the Northern Hemisphere.

3. The main anthropogenic sources of methane include the production and burning of fossil fuel, decomposition of organic matter (rice fields, garbage dumps, etc.), technological and accidental gas emissions (drilling, gas production, transportation, etc.).

4. The main natural sources of direct methane input into the water environment include microbial and biochemical degradation of organic substances in bottom sediments, decomposition of marine gas hydrates, and bottom gas seepage from shallow oil- and gas-bearing formations. Structural and functional changes of benthic communities are possible in such areas.

5. A potentially hazardous source of methane series hydrocarbons in the water environment can be their release during underwater pipeline damages as well as accidental blowouts during drilling activities on the continental shelf. The latter occurred in 1982 and 1985 in the Sea of Asov, where serious ecological and fisheries consequences were observed.

6. The natural content of methane in seawater usually varies from 10^{-5} ml/l (close to the equilibrium concentration) to 10^{-3} ml/l. It is higher in the coastal areas, bays, and estuaries than in open waters of the seas and oceans. Vertical distribution of methane in the water column is characterized by its elevated concentration in the upper water layers and sometimes in the layers near the bottom. In areas of accidental blowouts and releases of natural gas, methane concentrations in seawater can reach 1–10 ml/l.

7. The toxic properties of methane and its homologues in the water environment have been very poorly studied. Available materials suggest that these hydrocarbons belong to the group of poisonous gases that have narcotic effects and damage the nervous system. Acute fish poisoning and lethal damages occur at the concentrations of gas hydrocarbons over 1 mg/l. Primary behavioral responses are observed at levels as low as 0.02–0.1 mg/l.

8. The combined analysis of available biogeochemical and ecotoxicological data suggests that 0.01 ml/l is the approximate maximum permissible concentration (MPC) for methane in the marine environment. Levels over this limit can be found both in areas of technological and accidental gas emissions and in the impact zones of natural gas flow from the sea bottom.

9. The minimum effective (lowest observed effect) concentrations of gas condensate in the water for marine organisms are 0.05–0.5 mg/l, and the safe level is about 0.01 mg/l.

10. The given materials and estimates may be used to solve the practical tasks of environmental assessments, monitoring, and prediction of consequences during oil and gas field development on the continental shelf.

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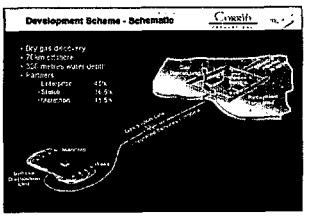
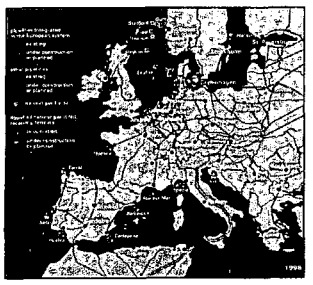
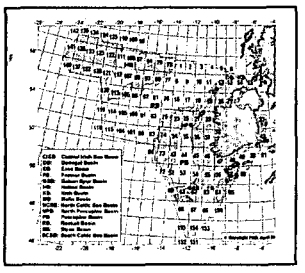
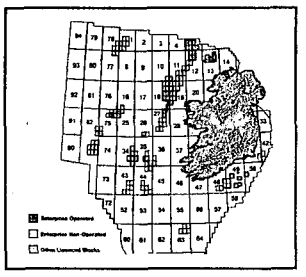
THE BRIAN COYLE OBSERVATION & OBJECTION REPORT TO THE FURTHER INFORMATION RESPONSE









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REFUSAL SHOULD BE GRANTED

TO THE SITE CHOSEN FOR CORRIB GAS TERMINAL

THE PROPOSED CONSTRUCTION TECHNIQUES & ROUTES

THE PEAT DEPOSITION SITE AT SRAHMORE

THE UPSTREAM HIGH PRESSURE PIPELINE ROUTE

BASED ON ITS WORLD RECORDS AND THE FURTHER INFORMATION RESPONSE

Should we allow the Corrib Gas Field to be Connected:

- ❑ To an Inland Terminal

And

- ❑ Becomes the only Inland Terminal In the WORLD?
- ❑ Surrounded in BLANKET BOG that can become unstable at an angle of 2degrees or more
- ❑ Connected from a Landfall at the Base of a Hill that is Unstable
- ❑ Residents as close as 60m to the High Pressure Untreated Pipeline
- ❑ Residents within the Explosion/Gas Vapour Exclusion Zone from the Terminal and High Pressure Pipeline
- ❑ Streams and Rivers within an exclusion zone feeding into a major drinking water supply
- ❑ The only World Wide Deposition of 450,000m3 of Acidic Blanket Bog
- ❑ Causing in excess of 100,000 traffic turning movements during its development
- ❑ Resulting in the removal and discharge of at least 400,000,000 litres (Four hundred million) litres of acidic water to the North and South of Carrowmore Lake, the only drinking water supply for the entire region
- ❑ In an Area of Natural Ground Instability

Why should we?
- when all the other World Wide Authorities have done different

As We Are Lead To believe by the Applicant That There Are No Other Alternatives! When in fact there are!

Is it the lack of experience in our Representatives and Authorities that they do not know the difference between right and wrong?

We do not want an Erris EU Directive to be written similar to the Seveso II directive that was written following the disaster and the ultimate consequence to people in the small town called Seveso in Italy.

The Content of this report is written without prejudice and should be read in conjunction with the initial report.

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Observer and Objector

The observations and the reasons given for refusal contained in this document are compiled and written by Brian Coyle BE, CEng, MIEI, MIStructE Chartered Consulting Engineer and are the observations of many of my immediate family and friends that reside throughout the Erris community. These observations and objections are contained within the full text of this document and are supported with references from standards, publish documents and from the applicant's response to the further information request issued by the Planning Authority, dated 17th Feburary 2004.

Proposed Development Planning Text

Bellagelly South & Srahmore Attavally Proposed Development.

PLANNING REFERENCE NO. 033343

LOCATION BELLAGELLY SOUTH
SRAHMORE ATTAVALLY

PERMISSION SOUGHT FOR

CONSTRUCT GAS TERMINAL FOR THE RECEPTION AND SERAPATION OF GAS FROM THE CORRIB GAS FIELD, AND FOR A PEAT DEPOSITION SITE, RESPECTIVELY. THE DEVELOPMENT WILL CONSIST OF THE CONCURRENT DEVELOPMENT OF TWO SITES LOCATED 11 KILOMETRES APART, APPROXIMATELY, AND IDENTIFIED AS THE SITE OF THE GAS TERMINAL FOR THE RECEPTION AND SEPARATION OF GAS FROM THE CORRIB GAS FIELD IN THE TOWNLAND OF BELLAGELLY SOUTH AND THE SITE OF THE PEAT DEPOSITION SITE IN THE TOWNLANDS OF SRAHMORE AND ATTAVALLY, BANGOR ERRIS. THE DEVELOPMENT AT THE BELLAGELLY SOUTH SITE WILL CONSIST OF: A GAS TERMINAL FOR THE RECEPTION AND SEPARATION OF GAS INCLUDING PLANT AND EQUIPMENT; PROVISION OF 4,935 SQ M (GROSS FLOOR AREA), APPROXIMATELY, OF BUILDINGS; ACCESS ROADS; 40 NO. CAR PARKING SPACES; AND ANCILLARY DEVELOPMENTS, OF WHICH 13 HA, APPROX, WILL BE DEVELOPED INRESPECT OF THE GAS TERMINAL'S FOOTPRINT. THE PROPOSED DEV. WILL OF THE BELLAGELLY SOUTH SITE WILL ALSO CONSIST OF; THE EXCAVATION AND REMOVAL OF 450,000 CUBIC M

Summary

- The applicants own recommendations are not been meet along the entire stretch of the public haul road even after upgrading works.
- The proposed road width of 5.5m is not verified in accordance with NRA standards or any other published documents and therefore it effectiveness and safety cannot be addressed for such large volumes of heavy traffic.
- Emergencies and contingencies have not been fully considered, addressed or resolved by this recent submission.
- The applicant has identified that the haul route is supported on 2-3m of peat
- The overall impact of the road improvement works on existing land, embankments, slope stability, drainage and private property is not fully assessed.
- Published documents state that there is a statutory requirement to provide for the health, safety and welfare of all employees and members of the public in connection with the design, construction operation and maintenance of pipelines
- Published documents state that it is desirable to avoid a route where the pipeline might be subject to heavy external stresses or where the consequences of a leak, if one did occur, might be particularly serious. In practice, all cross-country pipelines and some local pipelines will have to be subjected to a detailed safety evaluation as part of its consideration.
- The highly flammable liquid transported in the pipeline under pressure creates forces at bends, junctions, valves and all restrictions to, and changes in, direction of flow.
- Additional transient forces may be generated by pump starts or stops, valve closures etc. The vector analysis arising from high-pressure fluid in the pipeline must be resolved and hence the pipeline effectively supported or else it will fail.
- Section 2.2 in the EIS report states that the terminal is designed to throughput of 10 million cubic meters per day (350 million standard cubic feet per day).

- Taking account of the 10 million cubic meters per day and on the basis that 'volume in' equates to 'volume out' then the speed of flow through a 508mm diameter pipeline with a 25.4mm wall thickness will be a whooping c. 2,500km/hr (two thousand five hundred kilometres per hour).

- The applicant has stated the orthophosphate impact to surface watercourses from phosphate-impacted soils is widely recognised as being a major concern in certain parts of Ireland, because it can lead to eutrophication of lakes and rivers. The orthophosphate concentrations recorded by the applicant in the blanket bog is approximately 250-10,000 times greater than the allowable concentration in lake waters.

- The milling of peat commonly associated with the work that Bord Na Mona does is better compared to harvesting crops than removing saturated blanket bog. This statement is supported with picture evidence in the Bord Na Mona Website.

- The proposed construction work (grouting) resulting in the injection of chemicals into the ground where surface water run-off will flow into rivers and streams and then into a major drinking water supply for the entire region should undoubtedly be avoided. Published documents states that this process should be independently investigated.

- The applicant has now identified that the proposed process of removing the peat is weather dependent. Waterproofing sheeting will have to be placed over the peat every time it rains. Can you imagine acres of peat to be covered with sheets ever time it rains. Therefore, it could take many months and even years to remove the saturated blanket bog in order to meet the criteria put forward by the applicant.

Further Information Request Volume 1 No.1
Fully detailed traffic management plan.

Observation to Applicants Response

The applicants response to this request identifies that their own recommendations are not been meet along the entire stretch of road even after upgrading. The road geometry survey details submitted are extremely limited and do not convey the impacts of the road improvement works.

The proposed road width of 5.5m is not verified in accordance with NRA standards or any other published documents and therefore it effectiveness cannot be addressed. The applicant has raised their own concern in relation to the proposed road width when they suggest in Section 4.3 Par. 4.3.1

"where physically possible and where land between fences permits, a width greater than 5.5m is recommended."

It is physically possible and land does exist to meet this recommendation.

As previously identified the proposed haul route is the shortest route available to many people residing the North Erris area. The applicant has assumed that all emergences will be *transported using an emergency vehicle.*
This is seldom the case and often local residents transport their own medical emergences to Castlebar general hospital. Local residents have used this haul route to transport very sick people or a pregnant woman by private car to Castlebar general hospital. Once again peoples lives are at risk *with this proposed development.*

The time taken to travel along this section of road, with its envisaged poor quality, slippery surface, "*noticeable settlement*" surrounded with large vehicles carrying saturated and dusty material is a matter of great concern for the general public in this area. Trucks queuing at junctions to gain access onto major and minor roads will inevitably impede local traffic flow.
Therefore, emergencies and contingencies have not been fully considered, addressed or resolved by this recent submission.

There is insufficient information on the drawings submitted in addressing this request to determine the extent of the proposed road improvements.

It is obvious to anyone that drives along the proposed haul route that the existing pavement and road side embankments are not capable of supporting the local traffic that use this road. The applicant has identified that this road is supported on approx 2.0 -3.0m of Peat. Some roadside embankments are currently failing.

The drawings submitted to address this request (e.g. Drg. No. 2044-1010) contains limited information. The existing road geometry survey information included on the drawing is extremely limited and therefore the extent and impact that the upgrade works will have on adjoining land and existing land drains, water flow is not addressed effectively. The existing road is very narrow in some locations with steep unstable embankments, mainly consisting of peat. The survey information does not identify the gradient of this embankment or the location of existing land drains.
Therefore the overall impact of the road improvement works on existing land, embankments, slope stability, drainage and private property is not fully assessed.

Further Information Request Volume 1 No.2
Written confirmation from the relevant regulatory authority that the design of the proposed gas pipelines from the terminal compound to the site boundary is suitable to ensure the structural stability of the pipelines constructed in deep peat soil.

Observation to Applicants Response
The text of the applicant's response to Further Information Item No. 2 does not contain the necessary text to independently qualify the structural stability of the pipelines constructed in deep peat soil.

The applicant and/or regulatory authority has not justified or provided the qualitative assessment, analysis and design to justify that the pipeline is structurally adequate in poor ground conditions especially when it is surrounded in peat and/or mineral soil in an area of natural ground instability surrounded with heather and woodland that is susceptible to fires during prolonged periods of dry weather. We are all familiar with the intensive heat, rapid spread and uncontrollable damage caused by gorse fires. This risk exists and is more imminent as climate changes are expected to become more severe (Longer Dry Periods and Longer Wet Periods).

The pipeline route chosen should have been assessed based on its functionality, surrounding ground geology and its long-term performance in this environment. The structural stability of this pipeline and hence the Health and Safety aspects of this section of pipeline and indeed the entire pipeline must be considered.

Sections of the submitted documentation by the applicant from the Department of the Marine and Natural Resources dated 15th April 2002 is only a partial reproduction of some sections of text contained in the following British Standards.

BS 8010 Part 1: Pipelines on Land
BS 8010 Part 2: Pipelines on land; design, construction and installation
Section 2.8: 1992 Steel for oil and gas

A reproduction of part or any part of a standard is certainly not a means of justifying the structural stability of the pipeline. These standards are also referenced in Mr. Andrew Johnston report on the evaluation of Onshore Pipeline Design Codes dated 28th March 2002. Some of the design standards mentioned in Mr. Johnston report are now withdrawn or superseded. However, the safety aspects of the standards usually become more stringent as events and failures of pipelines occur.

Like most relevant standards or publish documents associated with the transportation of materials in pipelines, these documents contain specific references to safety requirements. Section 1.3 of BS 8010 Part 1 states that;

" *There is a statutory requirement to provide for the health, safety and welfare of all employees and members of the public in connection with the design, construction operation and maintenance of pipelines*"

The published document titled 'Guidance Notes for Applications and Notifications for Onshore Pipelines under the Pipelines Act 1962' published in 1993 also considers Pipeline Safety.

It states that

"it is desirable to avoid a route where the pipeline might be subject to heavy external stresses or where the consequences of a leak, if one did occur, might be particularly serious" "In practice, all cross-country pipelines and some local pipelines will have to be subjected to a detailed safety evaluation as part of its consideration. This is particularly the case for high pressure gas pipelines and a pipeline conveying toxic or highly volatile fluids, such as liquid petroleum gas (LPG), natural gas liquids (NGL) or ethylene."

The applicant and/or regulatory authority must consider and provide design details and calculations to justify the structural stability and hence the health and safety aspects of the pipeline including the surrounding landscape.

The section of pipelines queried in the further information request, and indeed any other section of pipeline should have been and must be assessed on the basis of structural stability, safety and integrity as there are various uses/work carried out on the surrounding landscape. The Health and Safety authority has a statutory obligation (under the health and safety at work act) to consider the health and safety of people at work. The long-term Health and Safety and people's livelihoods working at home and on the land (Agricultural use, building etc) prior to, during or after any possible failure/explosion event of the pipeline must be considered.

This information should be made available for independent verification. Design standards are often withdrawn or superseded by more stringent requirements. The current safety requirements in current standards will only become more stringent as more and more pipe failures occur. The statutory safety requirement will always be there and will be further enhanced as pipe failures keep occurring and environments and lives damaged and lost. Refer to 'Observation to Applicant's Response' Volume 1 No. 3 of this report for published documented facts.

The text contained in Section 8 of the Department of the Marine and Natural Resources letter dated 15th April 2002 acknowledge that upheaval buckling will occur when it states that

"*the proposed measures for mitigating upheaval buckling of the flexible in-field flowlines should be subject to review.*"

Upheaval buckling is only part of the overall problem associated with this pipeline route. Surrounding ground settlement and movement in any direction mainly lateral and vertical around the pipeline will considerably increase the pipe loading and thus excessive stresses in the wall of the pipe will occur that can cause fractures and ultimate failure of the pipeline. This can occur in an area of natural ground instability close to a major drinking water supply for the entire region. The length of the pipeline that can become unsupported during differential ground movement can increase the shear, longitudinal and bending stresses in the pipeline. When a pipe passes through/supported on adverse ground conditions e.g. waterlogged ground, peat, and mineral soil the likelihood and consequences of differential ground movement and settlement is inevitable.

The applicant specifically states in Section 4.5.1 of the EIS report;

"*that **minimal** differential movement of the ground **is essential** because*

- *for **safety** and operability, particularly for equipment operating under high pressure, piping and equipment require very tight tolerances on differential settlement.*

- *Piperacks, **piping** and equipment design and installation would be very complex in a plant subject to differential settlement.*

- *excessive settlement would create operability difficulties for equipment such as pumps, turbines and compressors*

The highly compressible and variable characteristics of the surrounding landscape (peat, mineral soil) surrounded in an area of natural ground instability places this pipeline at great risk.

The highly flammable liquid transported in the pipeline under pressure creates forces at bends, junctions, valves and all restrictions to, and changes in, direction of flow.
Additional transient forces may be generated by pump starts or stops, valve closures etc. The vector analysis arising from high-pressure fluid in the pipeline must be resolved and hence the pipeline effectively supported.

BS 8010: Part 1 Section 1.4 'Insurance' states that;

"Promoters should ensure that there is adequate third party insurance in force during design, installation and subsequent operation of pipelines."

The published CIRIA Report 164 states that the *HSE data for the period 1980-1990 showed that of some 600 incidents world-wide there were 128 incidents in the UK involving gas, including both fuel gases such as LPG and chemical gases such as chlorine. The major incident in the UK was the Piper Alpha disaster in 1990 in which 167 people were killed as a result of an explosion of LPG. Incidents have occurred as a result of the transfer of gas in pipelines, the build up of gas in sewers and natural gas accumulation in buildings (e.g Abbeystead)*

I request that the applicant and/or regulatory authority submit/provide details and design calculations for the structural stability of the high pressure pipeline taking account that it is sited in an area of natural ground instability surrounded in blanket bog and its failure could destabilise the ground even more. Further more since this pipeline is within an establishment a proper HSA zoning should be applied to the pipeline, identifying safety and risks to each zone.

The applicant has submitted the design calculations for the site drainage but has not provided sufficient details to demonstrate how the pipeline will be adequately supported. How does the applicant intend to support and stabilise the foul and surface water pipe network and prevent from excessive settlement, back fall and ultimate failure? Is the pipe network going to be piled and supported on beams? Bearing in mind that both networks will contain harmful contaminated substances.

The structural design, installation, operation, *performance and safety of all pipelines* supported on and surrounded in an area of natural ground instability should be adequately indemnified and collateral warranties given from each relevant regulatory authority and project member. The pipelines and any other element should not fail for the life of the structure, as the consequences of such can be dramatic.

This information should be publicly available and *independently verified. Otherwise the* application should be refused.
The applicant and regulatory/local authorities must justify and be aware of the consequences of their intended objectives and decisions.

Section 2.2 in the EIS report states that the terminal is designed to throughput of 10 million cubic meters per day (350 million standard cubic feet per day).

Offshore Technology Website indicated that well tests have confirmed a flow rate of 60 million ft³/day. Six wells are intended to operate at first. This is comparable to the 350 million standard cubic feet per day quoted in the applicant's submission. Offshore Technology Website states that the reserves in the Corrib field are around One trillion ft³.

Taking account of the 10 million cubic meters per day and on the basis that 'volume in' equates to 'volume out' then the speed of flow through a 508mm diameter pipeline with a 25.4mm wall thickness will be a whooping c. 2,500km/hr two thousand five hundred kilometres per hour.

We are all aware of how difficult it is to restrain and support a fire fighting hose, what will restrain this high-pressure pipeline? The blanket bog certainly will not.

Further Information Request Volume 1 No. 3
Proposals for system of collection and storage of any pumped water containing deleterious substances, including concrete, separate from

the surface drainage network and settlement ponds and to provide for its safe disposal.

Observation to Applicants Response
Grouting for Ground Engineering CIRIA C514. 2000 indicates and outlines the risk assessment and environmental impact assessment of grouting.

It states that

'it is an offence under the Water Resources Act, 1991 to cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters. Failure to comply with the above Act may lead to a criminal prosecution. Lacks of intent or negligence are no defence. In addition, expensive civil law suits may follow if harm is caused to someone else's person or property.
December 1997 the Environmental Agency had no defined policy on groundwater pollution caused by grouting in the ground.

It also states; *that any environmental impact assessment and especially the decision about admissible limits should be based on two largely independent investigations.'*

There should be an independent assessment made by an accredited body (with adequate PI insurance) as to the potential consequences arising from this method of construction. The EPA, WHO, Agrément Board bodies, should also confirm their acceptance.

This response should also deal with the safe collection and disposal of 'fire fighting' water. In the event of a fire, bunds around tanks can fill with fire fighting water and reach capacity prior to tank failure; the tank containing the dangerous substance can fail either during or after a fire thus there will be no containment volume for the dangerous substance. The applicant must identify a solution to this potential problem. Settlement ponds will not remove dissolved solids or chemicals in water. Containment bunds containing fire-fighting water will provide less storage volume for the dangerous substance.

The table below extracted from CIRIA Report 164 summarises the causes of loss of containment of liquids, which occurred at one large chemical complex in NW England. There were a 170 such incidents at the complex over a three-year period.

The cause of these incidents is listed below;

Transfer of materials through on-site pipework	37%
Failure of Storage Tanks	7%
Tankers (loading and off-loading)	7%
Compressor / oil bowsers	6%
Valves	5%
Pumps	2%
Other plant and Equipment	7%
Human Error	10%
Miscellaneous	19%

Note: the high percentage of pipe failures, storage tank failures and human errors. The risks of equipment failure alone associated with this development are very high and to further enhance these risks it is sited on poor ground, in natural ground instability, the only inland 8km upstream pipeline in the world, surrounded in blanket bog covered in heather, rush and forest that can quite easily ignite in the expected prolonged dry weather periods.

There are other onshore sites available that do not pose these risks.

The application should therefore be refused.

Further Information Request Volume 1 No. 5
Full details for the proposed sewage disposal system, including any water-table and percolation tests and the design of a suitably sized percolation area.

Observation to Applicants Response
The applicant response to this request states

"*the site investigation indicated that there is a perched water table in the peat and that the peat is relatively impermeable*"

This was also evident last Friday (26th March 2004) when local residents went to investigate and walk the land. The whole area was waterlogged and it was almost impossible to walk the site as people were sinking to there knees in the peat.

A soil percolation test at the location of the proposed puraflo modules / percolation area must be carried out as the effluent from the treatment system will only pond on the peat surface. This is not acceptable or adequate by any standard and the applicant's response to this request is inadequate. We are all aware how long it takes water to percolate through peat (weeks and even months).

Further Information Request Volume 1 No. 6
Submit a map outlining phosphate hot-spots, quantities of contaminated material, details of the analysis of the occasional occurrence of high levels of phosphorous detected in peat samples on the site and proposals to deal with the same including disposal. The format of the response shall include a comparison between

the total concentration (above background levels), that may theoretically, result from the development works and other land use activities that regularly occur in the area e.g. afforestation, clearfelling etc.

Observation to Applicants Response
The applicant indicates that numerous phosphorous soil sample points were located throughout the site. The maximum reported orthophosphate concentration was 219mg/l at a specific location but generally the concentrations were below 50mg/l in a zone close to the surface. They have stated that orthophosphate concentrations decrease significantly with depth and at greater depths (5.1m) decreased below 5mg/l.

The applicant has stated that the maximum limit for orthophosphate in river waters is 0.05-0.07mg/l and 0.02-0.05mg/l in lake waters. This implies that test results have indicated that orthophosphate concentrations in the blanket bog is approximately 250-10,000 times greater than the allowable concentration in lake waters.

It is imperative to realise that peat consists of approximately 90-95% moisture content (by weight) and now we are informed of its high phosphorus concentrations.

The applicant has stated on Volume 1 Item 6 Page 2 that

"Orthophosphate impact to surface watercourses from phosphate-impacted soils is widely recognised as being a major concern in certain parts of Ireland, because it can lead to eutrophication of lakes and rivers. The principal migration pathway via which orthophosphate typically impacts surface watercourses is via surface runoff."

The applicant once again ignores his own advice and proposes to perform work that will increase the risk of water contamination. The proposed works to the highly saturated and highly concentrated phosphorus blanket bog (containing 405million litres of acidic water) to place it in windrows and to deposit it at the Srahmore site following many mechanically loading, moving and unloading operations is dramatically increasing the surface area of the peat and thus allowing free water containing high concentrations of phosphorous to escape into the surface water streams, rivers, ponds and Carrowmore Lake via *surface runoff*.

The proposed blanket bog operations are;

excavating blanket bog to remove it from its current position at the terminal site,

loading to transport it to windrows at the terminal site,
transport it to the windrows at the terminal site
unloading to form windrows at the terminal site,
moved into windrows at the terminal site,

loaded again to be transported to Srahmore,
transported c. 11km to Srahmore
unloaded again at the Srahmore Site

loaded onto Bord Na Mona **Haku trailer**
transported to the final depositon site at Srahmore
unloaded at the final deposition site at Srahmore

and finally **compacted** at the deposition site at Srahmore. The compaction alone will cause water to escape.

The proposed [loading, transport, unloading] peat operations occurs at least three times, coupled with this is mechanically moving and compacting operations.

This sequence of operations is certainly not acceptable when one considers that there are alternatively sites available without any peat excavation or disposal requirements and outside the catchment area of a major drinking water supply for the entire Erris region. Water will continue to fall-on and escape from the peat when it is placed at the deposition site at Srahmore, (located to the south of Carrowmore Lake). The deposited peat will eventually absorb water thus reducing the shear strength and can ultimately cause peat failure. Remember the applicant has previously clamed that peat slopes can fail at angles of two degrees and above and their proposal have identified that water reduction is necessary for deposition of peat at the Srahmore site. Peatlands that have remained in place for thousands of years have failed, What make this site any different? Shear planes (2 degree and above) could occur within the main body of the peat.

Further Information Request Volume 1 No. 9 and Volume 2 No. 7
Information and proposals to address the possible impacts of free water from excavated peat on water quality, including PH and loading of humic and other acids.

An assessment of the impact of mineral soil being overlain on the existing peat soil.

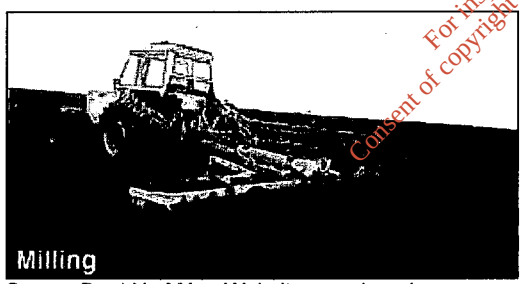
Observation to Applicants Response
This observation also comments on information submitted by the applicant in relation to

Request for further information Volume 2; Items 7.

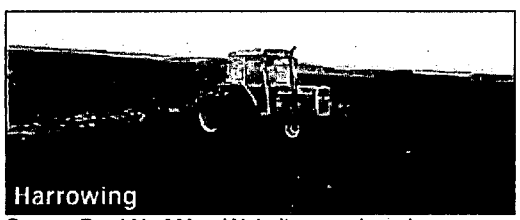
The content of the applicant's response to these items are misleading. On the afternoon of the 26th of March 2004 at approximately 5:00pm representatives from the Leenamore and Ballinaboy residents group and representatives from Shell walked the proposed gas terminal site. It was obvious to all that walked the site on that day that it was completely waterlogged and extremely soft sometimes people sinking to their knees in soft peat. It was reported that one of Shells representatives actually turned back as the conditions were so bad. Worked had commenced on site without providing any obvious protection/prevention of water pollution. It has been reported that, on site Shell's representative were informed of this and did not provide any evidence to demonstrate otherwise.

How then can the applicant suggest that the site is well drained? It may be well drained but the drains are not drying/draining the peat. The statement '*well-drained nature of the peat*' is misleading as this site visit suggested otherwise.

Bord Na Móna involvement with peat through the years is dealing with milled peat i.e. they effectively scrape the top 10-15mm from the surface and put it into windrows.



Source Bord Na Móna Website www.bnm.ie



Source Bord Na Móna Website www.bnm.ie

The dust like peat particles blow in the wind while this work is been carried out. This process or the works and any mitigation measures carried out during this process should not be compared with the removal of approx 450,000m3 of saturated blanket bog at Ballinaboy.

Source Bord Na Móna Website www.bnm.ie

This process and the main work carried out by Bord Na Móna is better compared to harvesting crops than removing saturated blanket bog. Comparing such process, works and mitigation measures is somewhat worrying and is an indication of the lack of knowledge in this area.

The applicant has already pointed out that water will escape from the blanket bog when it is excavated etc. Windrowing of the blanket bog will only affect the immediate surface of the windrowed peat. The impermeable nature of the blanket bog with its low voids ratio (unlike milled dust like peat) will not allow air to pass through the windrowed blanket bog and thus air drying is not effective. The blanket bog at low depth is inevitably in its virgin state. I welcome an on-site demonstration at Ballinaboy to prove different.

Bord Na Mona shows and states on their website that Peat cut with a hand held slane (winning) has a moisture content of 95%. This is after the bank of turf has been exposed to the elements for a full year. This is stated on http://www.ipcc.ie/cbwinning.html. How can they qualify then that windrows of blanket bog mainly in its virgin state will result in an effective reduction of the moisture content.

The Bord Na Móna submitted documentation contained in Volume 2 Item 7 is questionable for the following reasons.

- It is obvious from last Fridays site visit that the drainage system in place is not sufficient.
- Bord Na Mona has indicated that restoration of the drainage system is required implying that the existing drainage system is insufficient and hence the poor conditions experienced at last Fridays site visit.
- Blanket Bog below the invert levels of the drains should be considered to be in its virigin state and hence greater moisture content is expected.
- The water table was reported to be high

- They state that the free water in the peat drains away rapidly. Isn't the blanket bog very impermeable with very little voids?

- They have indicated that "depending on the prevailing weather condition such windrowing could lower the moisture content of the peat to approximately 80% over 8 days but would typically achieve 82-87%.

- The intended bulldozing and compaction of the peat will increase the risk of contaminated water escaping from peat and will increase the oxidation of the peat thus contradicting the statement made by the Applicant in Volume 2; Item 3 that "Nitrogen is reduced to Ammonia rather than oxidised to Nitrate" It is no wonder the second paragraph in Volume 2; Item 3 begins with the uncertainty statement that "It is not expected that the level of Ammoniacal Nitrogen will increase..". The submission requires more reassurance than that.

The industrial field trials should be observed and reported by an independent accredited body with adequate PI insurance, independent to companies involved with this application as the consequences of their report could have an overwhelming effect on the quality of water and surrounding environment. Evidence from the photographs (taken during this trial and submitted in the content of the applicants response) shows that this (one-off not independently verified test trial) was carried out in very good (sun shinning, blue sky) weather conditions.

The applicant states without technical support that

" the settlement ponds will provide a more than adequate buffer for any minor differences between the quality of the water released from the peat, and that present in the drains from other sources."

The quality of water in the drains at present is from surface water runoff and should not be compared to acidic water contained in the peat. Organic fibres arising from the disturbed peat may take many months to settle. Therefore, the capacity of the settlement ponds and the detention/attenuation time required is directly related to the suspended solid characteristics in the water and the rate at which they settle. Settlement ponds will not remove any dissolved solids.

Sudden surges from heavy rainfall will also disturb the settled solids. How does the applicant intend to cater for these events?
In the interest of the health and safety and for the control and monitoring of water quality I request that water sampling and testing should be undertaken by an approved independent testing authority not linked to the applicant. This water sampling and testing should be carried over a period of months to obtain an effective baseline existing water quality in the drains etc.

There are other alternatives available to the applicant that does not unearth such vast quantities of saturated blanket bog, containing up to 10,000 times the allowable quantities of pollutants in lake waters, posing a high risk to the water quality and surrounding environment.

For this and many other reasons, I request that a refusal to this application be granted.

Further Information Request Volume 1 No. 11

Information on the possible impacts on water quality, aquatic ecology and surrounding peatlands arising from the use of the highly alkaline lime/cement binder to comparatively small parts of the site. The information should include technical information and assessments to support the use and appropriateness of this method of peat improvement in this location.

Observation to Applicants Response
Construction work resulting in the injection of chemicals into the ground where surface water run-off will flow into rivers and streams and then into a major drinking water supply for the entire region should undoubtedly be avoided.

In the interest of protecting a major drinking water supply for the entire region, there should be an independent certificate of approval to demonstrate (Agrement Cert or a Cert from the WHO or EPA) that the proposed method of construction including the cement binder to improve the load bearing capacity of the peat will not affect the quality of the water. If this is not forthcoming then this method of construction should be avoided.

It is noted in CIRIA C514. 2000 'Grouting for Ground Engineering' was not part of the applicant research references. This document indicates and outlines the risk assessment and environmental impact assessment of grouting.

It states that

'it is an offence under the Water Resources Act, 1991 to cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters. Failure to comply with the above Act may lead to a criminal prosecution. Lacks of

intent or negligence are no defence. In addition, expensive civil law suits may follow if harm is caused to someone else's person or property.
At December 1997 the Environmental Agency had no defined policy on groundwater pollution caused by grouting in the ground.

It also states *that*

'any environmental impact assessment and especially the decision about admissible limits should be based on two largely independent investigations.'

It is inconceivable to think that the applicants 'Mitigation Measures' to prevent the escape of a leachate is done by blocking drains. *Can you imagine on site someone saying, 'there goes the leachate lets block the drain!' Oh hang on, its about to rain!*

Without prejudice, RSK ENSR general notes states that where any data supplied by the client or from other sources have been used it has been assumed that this information is correct. Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. There are too many assumptions and restrictions in order to achieve their client's objectives in their response.

I therefore request that the recommendations made in the CIRIA document be adhered too and that two independent investigations be carried out for the grouting proposal. This proposed method of construction should have an approved accredited status for this particular environment.
The attitude of the applicant to block drains is absolutely ridiculous. What happens in the event of heavy rainfall? What happens when grouting occurs below the invert level of the drain?

Based on the current submitted information and without independent verification of the impacts of this proposed method of construction, I request that this application be refused as there are other construction alternatives available including sites the will not require this construction technique.

Further Information Request Volume 1 No 13.
Investigation of the feasibility of only allowing surface water which is actively pumped from the site entering the settlement ponds and ensuring that site drainage during construction is a totally pro-active hydrometric process rather that a semi passive one. (Parameter would involve setting a maximum allowable output flow rate from the site and in the event that this flow rate is exceeded, flooding of the site is the end result, rather that dealing with the risk of overloading of the settlement ponds.)

Observation to Applicants Response
Certainly the surface water runoff to the settlement ponds should be limited to ensure that they perform their intended function. Turbulence in the settlement/silt ponds should be eliminated. A surcharge of water (high flow of water) entering the settlement/silt ponds will cause turbulence and an imbalance in the settlement pond and hence the solids will become suspended in the water.
Remember the applicant has submitted information to show that c. 2.25mm of rainfall caused an increase of flow from 25 l/s to 275 l/s within a couple of hours. This is a very low rainfall event and would occupy almost 1000m^3 in one hour.
An intense rainfall event could be 40-60mm of rainfall in one hour. The specific gravity of the suspended substances will vary and therefore the time taken for them to settle will vary. Any extreme event and its consequences should be accommodated and resolved within the site boundaries.

For this reason the response to this request is insufficient and therefore this application should be refused, as construction methods exist that will prevent this from occurring. Alternatively there are other sites available in less sensitive areas.

Further Information Request Volume 1 No 15.
A data history setting out the hydrological dynamics of the site to date. In particular the relationships between rainfall events, flows in perimeter drains and levels of phosphates and suspended solids.

Observation to Applicants Response
The applicant's response to item No. 15 states that phosphate levels have not been continuously measured even though it has been quoted by the applicant in FI Volume 1; Item 6 page 2 that

"Orthophosphate impact to surface watercourses from phosphate-impacted soils is widely recognised as being a major concern in certain parts of Ireland, because it can lead to eutrophication of lakes and rivers."

I am sure that this part of Ireland is no different!

Also, the applicant has not qualified the type of suspended solids, some solids will settle quicker than others and the settlement ponds must be designed to accommodate the settlement of all types of suspended solids not

just silt alone. Otherwise the chemically rich suspended solids will escape into the streams and rivers and hence into Carrowmore lake.

The complete excavation and operations carried out thereafter to unearth a huge volume of saturated blanket bog in a relatively deep and confined area cannot be compared to work already carried out by Bord na Mona. This work will unleash an abundance of organic material with high concentrations of containments into the water; some of it will remain in suspension for a long time while other materials (roots, timber, heather fibrous material etc.) will float on the surface of the water. Sudden surcharges of rainfall will also affect the settled solids.

The expected surcharge of water flow from only 2.25mm of rainfall is evident. FI request Volume 1: Item 15 Figure 1a shows that a c 2.25mm of rainfall caused a sudden surcharge flow of 275 l/s in drain 22 within a two hour period. This indicates a very quick high flow response arising from a rainfall event, which ultimately can disturb the settled solids.

Further Information Request Volume 1 No 16.
Proposals to deal with the storage of peat on site in the event of adverse weather conditions preventing sufficient de-watering of the peat to allow transportation to the deposition site.

Observation to Applicants Response
Dewatering of blanket bog covered with waterproofing sheeting cannot be compared to the dewatering process usually carried out by Bord Na Mona. The loose powder like material harvested by Bord Na Mona with a high degree of voids allows any moisture to percolate through the milled peat thus allowing it to dry shed water and hence effectively dry.
This will not happen with the windrowed insitu blanket bog, as there are little or not voids in peat hence its low permeability. Furthermore, any waterproofing sheeting will need to be anchored down tight to the peat surface further preventing water drying of the blanket bog.
It is insufficient and impractical to suggest that the windrowed blanket bog will be covered every time it rains. Is the peat going to be covered if a small shower of rain comes along? If its not going to be covered then the water content will increase etc etc. The covers on Bord Na Mona milled peat are usually on for months at a time.

The applicant has now identified that the proposed process of removing the peat is weather dependent.

Therefore, the applicant's response and proposal is insufficient, impractical as it could take many months and even years to remove this peat in order to meet the criteria put forward by the applicant.

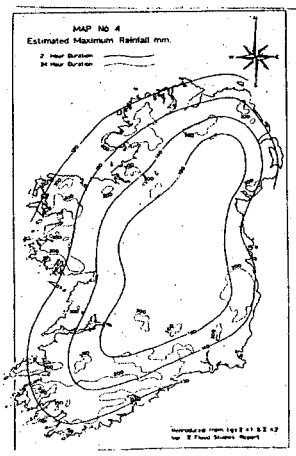
It is imperative to remember that the peat will contain in excess of 405,000,000 litres (four hundred and five million litres) of acidic water with high concentrations of phosphorus.
This is not acceptable as the peat contains high levels of chemicals that will undoubtedly escape into the surface water streams and rivers and eventually into Carrowmore lake thus affecting water quality.

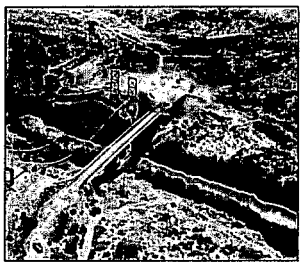
It is for these reasons also that I request that this application be refused. There are other sites available that do not require the excavation, removal and high risks that are associated with such large volumes of peat removal.

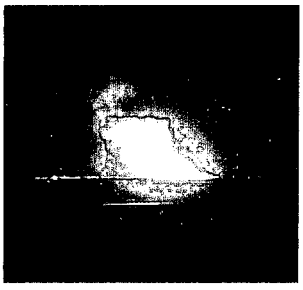
THIS IS SIMPLY THE WRONG SITE FOR THIS PROJECT.

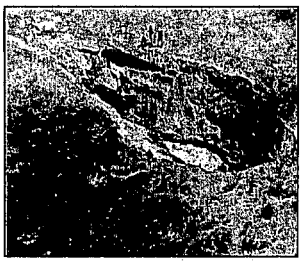
BRIAN COYLE SUBMISSION TO AN BORD PLEANALA

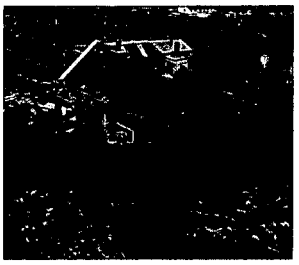
29th June 2004











Submission

Following receipt

Documentation from An Bord Pleanála dated the 3rd of June 2004.

in relation to the

Proposed Gas Terminal

for the

Corrib Gas Field

BP Ref : PL 16. 207212
PA.Reg.Ref P03/3343

The Content of this report is written without prejudice and is for information purposes only

By Brian Coyle,
BE, CEng, MIEI, MIStructE

Chartered Consulting
Civil & Structural Engineer
Director of COYLE KENNEDY LTD
Consulting Engineers

The following commentary/submission is made following receipt of documentation from An Bord Pleanála dated the 3rd of June 2004.

Following receipt and examination of other appeals from An Bord Pleanála it is clear that a majority of people are concerned about their safety from the terminal, high-pressure import pipeline, landfall and discharge pipeline, contaimination of Carrowmore Lake, silting of lakes streams and rivers and the threat that this development poses to people in the transportation and deposition of the Peat.

National and Local policies have been well identified, considered and reported in the appeal by Micheál Ó Seighin and Others. It is an excellent document in that regard. It is obvious that this proposed large industrial development on a green field site in an exceptional environmental sensitive area, does not come close to meeting or fulfilling either National or Local policies.

Prior to this and the previous planning application, residents residing close to the high-pressure pipeline believed that their safety from the high-pressure pipeline would be examined and concluded upon under the scope of the EU Directive (Seveso II) and SI 476 Regulation as the pipelines would be considered to be within the area of the 'establishment'.

To date this has not happened as the applicant and the HSA are doing their endeavour to limit the area within the definition of the word 'ESTABLISHMENT'. The simple reason is that the HSA or any other Authority cannot justify local residents safety. For this proposed development, the risks of high-pressure pipeline failure are greatly increased because it passes through an abundance of blanket bog that can easily subside. The peat itself is not capable of supporting the pipelines or any structures that is proposed to support them.

It is not statistics that local people want produced; it is a commitment and AN indication that they are safe on their land and in their homes. No 'purple book' can justify this overwhelming risk. A document prepared by the HSE (UK) titled 'Safety Report Assessment Guide: LPG' states that *the consequences of all accidents must be identified irrespective of there probability of occurrence.*

Any length of pipeline or supporting/relevant structure can become unsupported in blanket bog thus increasing bending, shear, torsion and axial stresses in the structure/pipeline. The required structural capacity and hence thickness will depend on the unsupported length of the structure. The subsidence nature of blanket bog, the ease in which the blanket bog can move and erode makes the design and performance of structures in blanket bog unpredictable.

For many months now, Mr. John Colreavy (HSA) tried to convince me that pipelines are excluded from the Directive and Regulations and therefore the HSA would not be considering pipelines in their advice under land-use planning. It has taken many discussions, phone calls and letters to get the written proof that pipelines and pumping stations within establishments are all to be considered and included within the scope of both the EU Directives and SI 476 Regulations.

Since it has been identified that pipelines within establishments must be considered, the HSA are now trying to swindle their way around dealing with their responsibilities and human safety by distinguish between pipelines above ground (in the pipe rack) and pipelines below ground (cross-country pipelines) within an establishment. I would ask the Board to be specific and cautious about the terminologies used.

A letter from Mr. Frank Fahey's Department of Enterprise, Trade and Employment is included in Appendix A. The Minister has responded to my letter based on advice from the HSA. Basically we are dealing with the same people (i.e. the HSA) ever time we raise an issue or a concern. To this end if we are unhappy with the advice of the HSA we write to our ministers to outline our concerns who will then revert back to the HSA for their advice. Why bother!

The content of the letter states, what I already concluded some months ago and identified in my first submission to Mayo County Council that pipelines and pumping stations within establishments must be considered.

- In the letter, the HSA view the 'establishment' similar to that stated in their report. No surprise there!
- The HSA have now put a name on the pipeline and then stated that this named pipeline is outside the scope of

the Directive. This is not allowed and is in breach of EU Directives and Irish Legislation. It is another attempt of ignoring the safety of the people residing adjacent to the high-pressure pipeline. At the very least all pipelines within establishments must be considered.

- Once again the HSA will not consider the presence and treatment of gas containing Hydrogen Sulphide, even though it is as likely to be present as not in a gas supply i.e. a biogas. I am not surprised. This toxic substance has been found off the Irish Coast as identified in my appeal.

The SI 476 regulations does not allow a redefinition of the term establishment like that considered by the HSA and does not allow the naming of pipelines for the benefit of excluding them from their advice. Also, the EU Directive does not allow the presence of an anticipated substance to be dealt with under a different planning application.

The HSA have now started naming pipelines (e.g. cross-country pipelines, pipelines in the pipe rack, slugcatcher pipe, and sales gas export pipeline at the pig launcher) hoping that this terminology will exclude them from examining the 'cross-country' pipeline within the establishment.

I would like to advise the Board that the EU Directive (Seveso II) and SI 476 regulation clearly identifies that if a pipeline is within an establishment and transports a dangerous substance (actual or anticipated) then the consequences of such must be identified and considered.

The Area within the term 'Establishment'
In the previous Oral Hearing the HSA concluded that the 'establishment' is the area within the security fence of the terminal footprint. It is now stated by the HSA that this definitions is based on DISCUSSIONS with other EU Commission officials. I do not believe that the full picture of this proposed development including the route for the pipeline can be conveyed accurately through discussions.

I cannot believe that the location of a security fence is what is dictating the area to be considered by the HSA. Failure of components and installations can occur inside and outside a security fence. The term establishment is clear, unambiguous and legally defined in the Irish Regulations and doesn't mention anything about a security fence or the area inside it. My discussions with a EU official concluded that a security fence has no act or part in defining the area of an establishment. The HSE (UK) states that off-site accident initiators should be considered.

Previous Oral Hearing
In the previous application, Mr. Moore (An Bord Pleanála) states that '*he does not accept that the Board can readily determine that the establishment is that area that falls within the security fence of the gas processing facility.*'

Legally Definition
Legally the 'establishment' is the whole area under the control of the operator where dangerous substances are present

Tánaiste Ms. Mary Harney T.D. Dail Question No. 111, Q&A Refer to Appendix A for Copy

Ms Mary Harney T.D. considered the term 'establishment' to be the site within the overall landholding of an undertaking where dangerous substances are present in one or more installations. Refer to Appendix A.

Dangerous substances are present in the pipeline from the terminal building to the site boundary and from the site boundary to the landfall. Local residents were lead to believe that this issue i.e. their health and safety from the pipeline that cross their land would be examined and concluded upon during the planning process for the Gas Terminal under the scope of the SI 476 Regulations i.e. the pipeline route would be part of the establishment. Surely they have a constitutional right to have this aspect fully examined and verified. My appeal to An Bord Pleanála included a report relating to a pipeline explosion. It stated that the consequences and affected area of an explosion from a 46Bar pressure pipeline was equivalent to placing, 5.7tonne of TNT in the ground with temperatures in excess of 1100°C from the pipeline explosion.

How would you feel if 5.7tonne of TNT was placed only a few meters from your residence not knowing if and when it will explode?

The reality is that people are not at a safe distance from this proposed development and its related infrastructure.

A letter from the HSA dated the 15th of June 2004 in response to my letter dated the 27th of May 2004, concludes that the HSA has will not accede to my request i.e. treatment of gas containing Hydrogen Sulphide or providing advice on the failure of the high-pressure pipeline. They are only considering the safety of construction workers involved with the pipeline construction. This is complete lack of competence and is discriminative to the local residents concerned about their children's and their own safety. A copy of the HSA letter is included in Appendix B.

Safety Assessment for People Residing Adjacent to the Proposed High Pressure Pipeline is the responsibility of An Bord Pleanála

Dr. Rory O'Hanlon (Ceann Comhairle)
In a letter to Mr. Paddy McHugh T.D. dated 31st of May 2004 Dr. Rory O'Hanlon identifies that the safety assessment for persons residing adjacent to the proposed high-pressure pipeline transporting dangerous substances to the proposed Gas Terminal is a matter which falls within the statutory remit of An Bord Pleanála. A copy of his letter is included in Appendix B.

Recent Amendments to the Seveso Directive 16th December 2003
Recent amendments to the Seveso Directive due to recent major accidents state that advice and guidelines relating to land-use planning is expected to be available by 31st of December 2006. A copy of the amendment is included in Appendix G. I am confident that the content of these guidelines will certainly identify that this proposed site including the pipeline route is certainly wrong and that the process to date is in breach of EU Legislation especially the withholding of the HSA report until a decision was made by MCC.

As stated in my previous observations and submissions, Directives, Guidelines and Regulations keep changing to incorporate the consequences and effects of recent events. This is why the Seveso II Directive was amended. The consequences of an explosion even similar to the one that occurred at Dublin Port are unimaginable. This explosion occurred at an already established industrial site. The explosion/fire occurred from an Oil based product. Imagine what the consequences of such an event would be if it was gas (more explosive and vigorous than oil), surrounded with forestry, heather and blanket bog. The consequences of this type of an event, in an area deficient in services, will become a reality some day if this project gets the green light.

Rainfall Intensity Inadequate based on Flood Studies Estimation and Recent Events. Ground Instability and Water Contamination, now a serious concern

The remarks made by Mr. Iain Douglas relating to *Risk of Landslides* on page 46 of the planners report is questionable and doesn't form an encouraging basis to rule out the risk of landslides at the Gas Terminal. He states that the rainfall intensity of (45mm/hr) was chosen for the design of the site drainage at the proposed Gas Terminal Site at Bellanaboy and in his opinion and others this forms a conservative and somewhat sound solution to the issue of landslides, as it is based on the worst known event.
This is incorrect as the worse known event in Ireland is 97mm of rainfall in one hour, An event of this type can happen almost anywhere in Ireland.

Recent Report for Mayo County Council into the events of September the 19th 2003.
The examination and report carried out by Tobin Consulting Engineers for Mayo County Council (issued the 29/10/03, approx six week before Shell made their recent submission) into the reported 40 separate Landslides at Dooncartoon, Glenglad, Barnahuille, and Pollathomais County Mayo states in the executive summary that;

*'Analysis of the rainfall event from several perspectives supports the view that **not less** 80mm of rainfall fell on the slopes of Dooncartoon and Barnachuille mountains with a space of time less than two hours on that night'*

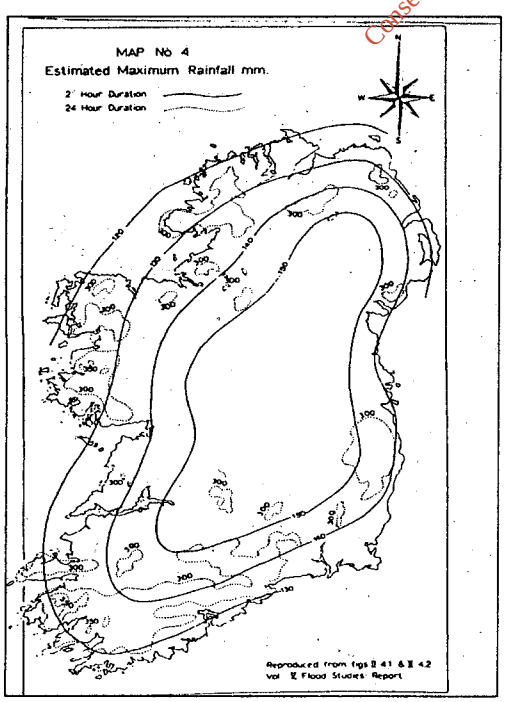
This statement suggests that the rainfall intensity on the 19th of September 2003 could have varied from 40-80mm over an unspecified time of less than two hours. This fact is

supported with reference to the Flood Studies Report and other reports published in recent times. Tobin Consulting Engineers are also a member of the design team for the proposed Gas Terminal. This I fee is a conflict of interest as it is unlikely that they would report an event that could ultimately result in the refusal of the proposed Gas Terminal. The Flood Studies Report was prepared by the Institute of Hydrology and determines the expected estimated rainfall throughout Ireland.

Flood Studies Report

Synopsis Contained in the Institution of Engineers of Ireland Flood Estimation following the Flood Studies Report written by *Professor* ***Conleth Cunnane BE, Ph D, M.I.E.I NUI Galway and M.A. Lynn M.E., B. Sc., CEng., FIEI.***

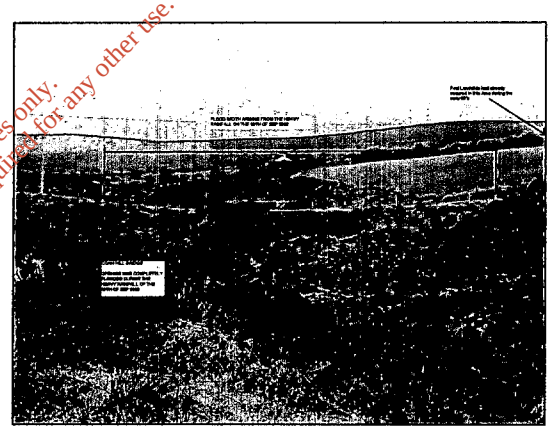
The flood studies report was published in April 1975, and dealt with an investigation carried out since 1970 at the Institute of Hydrology, Wallingford and Meteorological Office, Bracknell. The Irish Office of Public Works and Meteorological Service participated in the studies and supplied data on floods and rainfall in Ireland for inclusion in the analysis. The results are accordingly applicable in this country and provide improved bases for flood estimation.



Map No. 4 of the flood studies report shows the estimated maximum rainfall in a period of 2 and 24 hours throughout Ireland. It is clear from this Map that the upper rainfall intensity in the vicinity of the proposed Gas Terminal can vary from 60-120mm per hour based on Flood Studies Report estimation. My discussions with other Hydrologists support these findings. Since this Flood Studies Report has been published, weather conditions have become more severs i.e. more intense dry and wet weather conditions.

The so-called 'conservative' surface water system design is underestimated based on the Flood Studies Report and this can have major consequences on risk of landslides, and pollution to streams, rivers, and Carrowmore Lake.

Therefore, as proposed the surface water drainage system is not a pro-active one.



On the 19th of September Cornhill Bridge (South of Dooncartoon Hill) was completely covered with the huge volumes of water that flowed down the south side of Dooncarton hill and over the bridge. The channel width and volume of water that passed over this bridge was frightening.

Peat slopes have failed due to third party interference, inadequate drainage, steep slopes, and intense rainfall. Where is the assessment and conclusion on these events?

Condensate

On page 7 of the planner report, Mr. Iain Douglas has identified that the 'incoming gas is separated from the condensate, water and methanol' the recovered condensate is stabilised and used as fuel.

The threshold quantities of materials have changed in the recent amendment to the Seveso II directive dated 16th of December 2003. Petroleum products have now been defined and quantified and I would ask the Board to consider the volume of condensate that will be recovered stabilised, stored on site and used as fuel.

EU Directive (Seveso II) Article 12

Land-use planning

1. Member States shall ensure that the objectives of preventing major accidents and limiting the consequences of such accidents are taken into account in their land use policies and/or other relevant policies. They shall pursue those objectives through controls on :

a. the siting of new establishments,
b. modifications to existing establishments covered by Article 10,
c. new developments such as transport links, locations frequented by the public and residential areas in the vicinity of existing establishments, where the siting or developments are such as to increase the risk or consequences of a major accident.

Member States shall ensure that their land-use and/or other relevant policies **and the procedures for implementing those policies** take account of the need, in the long term, to maintain appropriate distances between establishments covered by this Directive and residential areas, areas of public use and areas of particular natural sensitivity or interest, and, in the case of existing establishments, of the need for additional technical measures in accordance with Article 5 so as not to increase the risks to people.

2. Member States shall ensure that all competent authorities and planning authorities responsible for decisions in this area set up appropriate consultation procedures to facilitate implementation of the policies established under paragraph 1. **The procedures shall be designed to ensure that technical advice on the risks arising from the establishment is available, either on a case-by-case or on a generic basis, when decisions are taken.**

Term Dangerous Substances

According to the Seveso II directive the presence of dangerous substances is the **actual** or **anticipated** presence of a substance. This is a legal obligation that must be considered now. The directive does not allow anticipated substances to be dealt with under a separate planning application. I advise the Board that adopting such a process and route will be in serious breach of EU Directive legislation. All anticipated substances must be considered now, e.g. Hydrogen Sulphide, Condensate etc.

HSE Safety Report Assessment Guide LPG Attached

The HSA Report makes reference to the UK HSE (Health and Safety Executive). I attach a report titled Safety Report Assessment Guide: LPG for the Boards information

This document is available on the http://www.hse.gov.uk/comah/sraglpg/srag.htm .

THE HSE DOCUMENT STATES THAT THE CONSEQUENCES OF AN ACCIDENT MUST BE DETERMINED IRRESPECTIVE OF ITS PROBABILITY OF THE ACCIDENT.

Refer to Criterion 3.4.1 on page 22 of the HSE attached report. Please refer to Table 1 page 16 and Table 2 Page 23 of the attached report identifying the off-site Accident Initiators. The HSA (Ireland) has only considered a few of these proposals and there are many more yet to consider and advise upon.

Off-Site Accident Initiators (HSE UK)
According to the HSE (UK) document the following Off-site Accident Initiators should be carefully examined and reported on.

Landslip
Hazardous Substance pipeline rupture
Missile from off-site
Fire or Explosion at adjoining sites
Subsidence
Flooding
Severe Environment Conditions;
- Abnormal Rainfall
- Abnormal Snowfall
- Very Low Temperature

High Termperature
Gale Force Winds

Lightning Strike
Aircraft Impact
Other
Sesimic Event

Detailed assessment should be carried out on initiators that are relevant to the site. e.g. *if a site is located far away from an airport or flight path then it is acceptable for the safety report to refer to the background crash rate. On the other hand, if the site is located close to a busy airport a much more detailed assessment of aircraft should be carried out.*

Applying the same analogy to initiators that are associated to this site implies that detailed assessment must be carried out for Off-Site initiators of Landslip, Hazardous Substance Pipeline Rupture, Fire or Explosion of the Section of Pipeline Off-site, Missile from off-site that could arise from pipeline explosion, arson or sabotage, Subsidence, Flooding, Severe Environment Conditions, Other e.g. Forest Fires.

Availability of a Public Safety Report (HSA Technical Advice) Prior to Mayo County Councils Decision

The technical advice on the risks arising from the establishment (HSA safety report) was not available to the public when Mayo County Council made their decision. Withholding such information is contrary to Seveso II Directive Article 12 *Land Use Planning* when it states that procedures under land use planning;

shall be designed to ensure that technical advice on the risks arising from the establishment ***is available****, either on a case-by-case or on a generic basis, when decisions are taken.*

I attach a copy of a letter from Mr. Iain Douglas SP to me dated 23rd of June explaining his interpretation of the Acts and Regulations. A copy of his letter is included in Appendix E.

The technical advice was submitted to Mayo County Council in the form of a document; therefore it's a submission. Why should Local Authorities withhold such important information from a National Authority in relation to the safety assessment of a planning application until a decision is made? Like all other prescribed bodies, the HSA document or other relevant document should have been available to the public. This document should have considered all the risks and be available for examination and verification before Mayo County Council made their decision?

In this instance, I believe the procedures adopted by Mayo County Council were set up to force the planning through irrespective of public opinion on the HSA safety report. This is another breach of EU legislation.

Forest Fires

The HSA report does not identify the risk contours or possible affected areas arising from a Pipeline Failure/Explosion for the pipeline even for the section of pipeline within the site boundaries and inside the security fence. Certainly all areas within the site boundaries are under the control of the operator therefore an area of the establishment. They are proposing to place this high-pressure pipeline in blanket bog amongst tress. What happens if the pipeline fails releasing gas, igniting, and hence forest fires (Domino Effect)? According to the HSE (UK) *The consequences of all accidents must be determined irrespective of their probability of occurrence.*

Design and Build Contract proposed for Onshore Pipelines is Worrying. Refer to Appendix F for a printout of the Notice

Shell has recently issued a Qualification System for the Provision of onshore Gas Pipeline **Design Verification/Completion** and **Construction** services for the Corrib Gas Field Development. It is no wonder that information requested by me and subsequently by Mayo County Council on the structural stability of the pipeline in peat was not readily available or produced as it is now clear that the applicant is requesting a design and build package for the onshore high-pressure pipelines.

I am concerned that a design and build contract is proposed for this section of the work. The selected contract may not ultimately be the safest one. How is the contract awarded? Who controls who, the contractor or

the engineer? How does Shell fit in to all this? Do they really care?
Who determines which design is right or wrong, since this has never been done before?
When constructed, it will be too late for the designers to revert back to their design if they find that the pipeline or terminal is not stable enough. Remember the Millennium Foot Bridge in London had to be dampened/strengthened because of unforeseen events that arose. With such a prestige project, I am sure with all the best will in the world the engineers of the Millennium Bridge didn't want that to happen.

Fluid/Air pressure testing prior to commissioning will not equate to the hoop, bending, shear, torsion, and axial stresses that will be experienced during operations and arising from external forces.

In a design and build contract, will quality and workmanship suffer if a contract of this nature is loosing money?

The objection of Shells qualification system states that Shell has completed much of the existing design work, however, THE APPLICANT WILL BE REQUIRED TO **VERIFY THE EXISTING DESIGN** and complete outstanding items such as crossings, special construction area, valve foundations etc. This is not encouraging. Here we have Shell admitting that their own design work must now be verified and basically passed onto some else. Talk about a 'cop out'. This is a clear indication that Shell does not want any act or part and will shed their responsibilities as long as Authorities and Companies keep accepting their proposals and invitations.

Brian Coyle BE CEng MIEI MIStructE
Chartered Engineer