

RESPONSE TO JOINT COUNTY AND BOROUGH COUNCILS' 1991 REVIEW OF POST-FLOODING BUILDING MORATORIUM ON MORFA RHUDDLAN

1. INTRODUCTION

The North Wales Flood Defence Group welcomes the Councils' review document's recognition that the flood defence of Morfa Rhuddlan is a complex safety issue with wide-ranging implications for future urban planning.

After discussions with senior Council and NRA officers we sense that work is needed to develop an agreed overall conceptual framework within which the different proposed planning options can be assessed properly. It is hoped that this paper can help towards that end.

2. SURVIVABILITY AS A GENERAL SAFETY ISSUE

2.1 The survivability principle Because maritime safety planning is an unfamiliar topic we feel the following comparison may be useful:-

FLOOD DEFENCE FEATURES	MARITIME	MARINE
(i) External structural	Sea defences & river embankments	Hull design
(ii) Internal structural & infrastructural	Floodplain: size & geography Drainage & pumps Layout of developments Access & exit roads	Hull: volume, loading, bulkhead design Pumps Cabin arrangements Stairway & deck layout
(iii) Non-structural, microstructural or suprastructural	Population factors: size, mobility, age structure Warning systems Evacuation contingency plans: vertical and/or horizontal	Passenger list: size & composition Navigation & warning systems Evacuation contingency plans: including lifeboats

In marine terms the *Titanic* disaster showed the folly of wishful over-reliance on structural flood defence for survivability. Ironically in Ro-Ro ferry design, however, since the Zebbrugge ferry disaster attention has turned back full-circle not only to warning systems but also to internal structure, in particular below-waterline compartmentalisation and the potentially pivotal effects of overloading on lead times.

These different examples both illustrate an important general principle: *mass safety standards must go beyond primary prevention and are only satisfactorily achieved when internal structural and non-structural measures are also deployed in a balanced effort to increase survivability*. Paradoxically also, wherever survivability is ignored in planning then warning systems also tend to become neglected or over-ridden.

This principle is now accepted in road safety, where external features (wider roads, crash barriers) must be combined with both internal ones (e.g. crumple zones) and non-structural measures (compulsory wearing of seat belts).

Even in civil aviation it is now accepted that increased survivability standards – however small in effect as against the overall risk, itself small – are achievable and must be set.

3. SHOULD SURVIVABILITY APPLY TO MORFA RHUDDLAN?

Since the 1990 floods both the public and various authorities have reacted in various ways to the survivability issue, and we would comment on these reactions as follows:

3.1 The public It can hardly be denied that both the emergency services' ability to cope, and many individuals' capacity to survive, were severely stretched in February 1990. Deaths from hypothermia and/or drowning would surely have ensued had the same flood event begun at night or even late evening. Arguably the survivability question would have answered itself.

Even with maximum daylight hours to assist evacuation, the first stage of rescue for many elderly bungalow dwellers in Towyn was being picked up from water around or above waist level and transferred to neighbours' first flood accommodation. For example one upstairs flat (10A Llys Arthur) acted for five hours as temporary safe haven for about 20 people. Many similar transfers were made in haste for children and others elsewhere, playing a major part in reducing the risk and extent of hypothermia.

With such memories fresh in mind the survivability principle was widely accepted in the first, and in our view crucial, sentence of the petition signed by 4,800 residents in March/April 1990, which led to the present moratorium – namely that *'even after sea defences are repaired a residual risk of catastrophic flooding must be assumed to remain'*.

It is important to point out that both over-reaction and denial are phases of the now well-recognised 'post-traumatic stress syndrome'. After such a stressful event and its aftermath, it is perhaps to be expected that the review document should engender widely differing extreme reactions to the survivability issue. The NWFDG feels that that for those concerned with planning the key phrase is *'residual risk'* – use of which paves the way towards honest acceptance and evaluation rather than becoming stuck at either the over-reaction or denial stages in thinking.

Incidentally, in 1990 the manifest risk to life and property was not (as implied in the Councils' review document) confined to flooding from the Towyn breach. Considerable overtopping occurred both in Pensarn (from the sea wall) and in Kinmel Bay north of the railway (from the River Clwyd's W embankment) – the latter cause, for example, being entirely responsible for the flooding of approximately 30 dwellings in the low-lying areas (3.3-3.8m above OD) of Aber Clwyd and Kendal Road/Bodelwyddan Avenue.

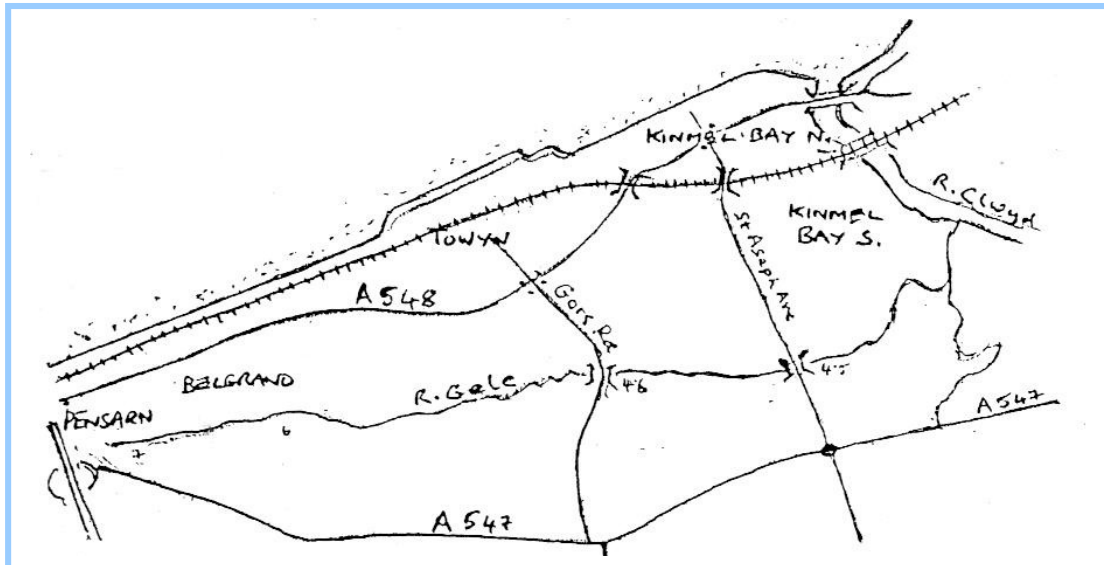


Fig. 1: main features compartmentalising Morfa Rhuddlan

An equally large volume of intrusive flooding (probably from a breach in sea defences) would clearly be needed to fill the entire flood plain to the same extent as in 1990. However, in principle a ten or twenty times smaller volume (e.g. from overtopping or subsidence of a river embankment) might quickly reach the same level within a correspondingly smaller section of the flood plain. Yet if still more water entered this section, spillover into adjoining compartments might be assumed usefully to limit both the rate and extent of further water level rises until the total flood volume exceeded that of 1990.

This analysis would assume, along the lines of the Royal Borough of Windsor & Maidenhead's flood plain residential development control policy¹ (the relevance of which was made public the week following the Flood Disaster through the Wales national documentary TV programme *Week In Week Out*), that (i) a very high proportion of the remaining natural flood plain remains substantially unaltered in level, and (ii) developments (including gardens and landscaping projects) are not allowed to create the potential for flood water to be further dammed or obstructed in its flow across or between compartments.

On this basis, from whichever source the intrusive flood risk is considered (the sea, River Clwyd, River Gele) for the major proposed new housing areas (Park Avenue and Gors Road) there could be a logical convergence towards a figure at or around 5.0m above OD as a floor level standard.

For one-off infill developments a slightly lower level (e.g. 4.7m above OD) might deal with arguments concerning overlooking and alleged devaluing of older properties as follows:-

1. Such a standard cannot be said to be entirely new since in nearly all the areas flooded in 1990 a percentage of older dwellings is already built into it.
2. Such properties cannot easily be picked out from neighbouring ones on casual inspection.
3. In many or perhaps most existing properties with lower ground floor levels a reasonable (albeit less certain) degree of secondary home flood defence up to 4.7m could – now or at any point in the future – be achieved at no greater expense than for building up ground floor levels of new houses, using flood guards etc.

COMMUNITY	TOTAL DWELLINGS	BUNGALOWS WITHOUT LOFT	HOUSES, FLATS & BUNGALOWS WITH LOFT
Pensarn & Belgrano	1065	543 (51.0%)	522 (49.0%)
Towyn	853	561 (60.8%)	292 (39.2%)
Kinmel Bay (N of railway)	1068	756 (70.8%)	312 (29.2%)
Kinmel Bay (S of railway)	881	584 (66.3%)	297 (33.7%)
TOTAL	3867	2444 (63.3%)	1423 (36.8%)

Table: existing dwellings on Morfa Rhuddlan (1991)

From the table it can be seen that the overall proportion of bungalows without loft windows is 63%. This proportion rises to 71% in Kinmel Bay north of the railway – a front line area from the point of view of exposure to the sea, but one where emergency road access is difficult to improve and where a comparatively low percentage of existing bungalows (359 of which are clustered together in the Sandy Cove area immediately behind the sea wall) have easy potential for loft conversion.

However survivable new estates are built to be, from the emergency viewpoint there will still be an apparent mismatch in that existing housing stock must obviously stay where it is – often in relatively exposed and poorly accessed ‘front line’ areas such as Kinmel Bay north of the railway, Towyn north of the coast road, and parts of Pensarn.

Nevertheless the recommendations of the Welsh All Party Commons Select Committee² (APCSC), taking some of its cues from the Windsor & Maidenhead development control policy, are positive and forward-thinking. It is implicit that sensible survivability-based design and layout in new developments potentially benefits owners of existing properties in that they can at least be reassured that their emergency coverage will be further delayed by unnecessary diversionary demands. New standards should also spur sensible improvements, on a voluntary basis but perhaps also grant-aided, to older housing stock. However, it needs to be pointed out that, although the APCSC recommendation that ‘new developments should be built up so as to ensure adequate flood defence up to at least the crown of the road’ is sound in principle, this does require clarification in the light of local topography.....

Besides the railway and the Gele river’s northern embankment it is only the main roads (Foryd Road, St Asaph Avenue, Gors Road, Towyn Road) which act as major compartmentalisers of the floodplain (see Fig 1). Levels of these major roads, originally built in 1794 as causeways, vary only within the range 4.5-5.0 m. By contrast, as judged from service maps, perhaps 90% of the natural flood plain surface lies between 3.8 and 4.5 m above OD (extreme range 3.3-5.0 m). Meanwhile over 90% of the area covered by flood water in 1990 water levels did not exceed 4.7m above OD (range 3.5-5.0 m).

This analysis would assume, as with the Windsor & Maidenhead development control policy, that (i) a very high proportion (eg. 90%) of the natural flood plain itself remains substantially unaltered in level, and (ii) developments (including gardens and landscaping projects) are not allowed to create the potential for water to further dammed or obstructed in its flow between or across compartments.

3.2 THE ALL-PARTY COMMONS SELECT COMMITTEE (APCSC) REPORT

3.2.1 Warnings and Survivability. It seems generally accepted that the APCSC's report correctly emphasised weather information and flood warning systems.

However infrequent one might hope floods will be in the future, serious flood *warnings* seem certain to be progressively more frequent. For example the official UK prediction is of a mean sea level rise of 24-38 cm by 2050. Climatologists have predicted that even a 15 cm rise will treble the incidence of serious storm surges in the Irish Sea. Present weather trends are quite clearly fulfilling climatologists' predictions, originally made over 15 years ago, of an increasingly unstable pattern of droughts and storms, some of the latter being of an intensity not yet recorded in these latitudes.

In this context the residents of Morfa Rhuddlan, along with other at-risk populations, must be dealt with sensitively and honestly if both unnecessary stress and unwarranted complacency are to be avoided. In proposing new building codes the APCSC was clearly influenced by the practical and moral ambiguity of upgrading warning systems, while also allowing inappropriate new developments to compound existing survivability problems and unduly increase the potential burden for emergency services in the event of floods or serious threat of floods.

If serious warnings are efficient, it important to grasp that the otherwise apparently random 1 in 100 or even 1 in 1000 year event has an almost 100% chance of occurring during such a warning period, rather than at any other time. In principle, for example, if the recent run of serious storms (1976, 1983 and 1990) is assumed merely to continue, representing an ongoing frequency of serious flood warnings averaging once every seven years, it would clearly follow that there is an ongoing 1 in 140 chance of the 1 in 1000 year (breach) event actually happening during any one such warning period, and perhaps a 1 in 14 chance of the 1 in 100 year (overtopping) event, etc....

As when an aircraft takes off or lands, or a ship is warned of an approaching collision risk, so during serious flood warnings acknowledgement is made that appreciable risk for a large number of people has been compressed into a short space of time – i.e. that a serious potential exists for disaster.

Consistency demands that survivability should be taken seriously wherever such warnings are deemed likely to be necessary – especially if their frequency is likely to increase. The true frequency during the present decade could well average once every 3-5 years, perhaps narrowing to once per two years within a generation, and more than once per year by 2050.

3.2.2 Specific building code recommendations In proposing first floor escape windows out of new dwellings, and alternative exit routes in new housing estates, the APCSC must obviously have felt that residual risk and survivability would and should remain items for serious consideration even after repair of sea defences.

To consider this matter properly some effort at quantified assessment of present housing seemed to us essential. In the absence of official data, our own street-by-street count (March 1990) of all existing housing stock on Morfa Rhuddlan has confirmed an extraordinarily high proportion of bungalows, mostly without loft windows (see table, p.4).

3.3 THE GOVERNMENT RESPONSE TO THE APCSC REPORT

Although the government's written response agrees with the need to improve storm and flood warning systems, and confirms that measures are in hand to do so, the APCSC recommendations are curtly dismissed as inappropriate without any apparent understanding of the real value, not least in terms of reassurance, of built-in survivability when a population has to cope with those warnings in the knowledge that they will become progressively more frequent and potentially serious.

It is as if a ship's crew were being warned of foul weather while being advised and equipped to prepare for fair weather only.

The government statement that 'many of those living in single storey properties do so because they are elderly or handicapped and would not be able to gain access to a rood space' grossly misrepresents a problem by overstating it. 98-99% of bungalow dwellers choose to live as they do purely for convenience and not because they could not get upstairs if they had to in an emergency.

The further suggestions that 'access to floors raised above flood level might also be difficult where deep waters could be anticipated in the event of a breach in sea defences' parodies the concept of survivability. Lifeboats do not cease to be appropriate just because modest effort is required to get into them.

The government response here may represent a somewhat confused recollection of the 1953 floods, where up to half of the deaths were of bungalow dwellers trapped in lofts without escape windows. (The Chair of the present group lived in East Anglia and was an emergency rescue worker during the 1953 floods). The potential for such an extreme scenario will almost certainly never face the present generation of Morfa Rhuddlan residents. Nevertheless in the context of warnings about the likely effects of global warming it seems inexcusably short-sighted not to start planning for it now.

The plain fact is that during night time flood warnings any property with an upstairs safe haven, preferably also with a suitably raised ground floor level, would for the vast majority of residents have the same reassurance value as would a ship with lifeboats. For all but the most extreme of flood warnings vertical evacuation is surely a far more realistic and reassuring option to live with than the constantly recurring possibility of out-of-area (horizontal) evacuation, which for the elderly has its own bad-weather hazards too.

A key (if often unspoken) question for many people, whether handicapped or not, is and will remain how to retain peace of mind at night. Regardless of reassurance about rebuilt structural sea defences, high tide levels cannot be hidden away and the sea itself is a restless and self-advertisingly noisy neighbour.

The proposed volunteer flood warden scheme should serve to assist the emergency services in identifying seriously handicapped or vulnerable people and reassuring them that they could be catered for proactively from the earliest stage of any serious flood warning. Such people are an important minority whose interests must be protected against any preventable demands on emergency services.

3.4 THE NATIONAL RIVERS AUTHORITY (NRA)

This group appreciates work under way by the NRA to dispose of splashover at Towyn, improve drainage, and reinstate river embankments where subsidence has occurred near the Foryd Road Bridge. We understand that such work will greatly assist towards ensuring that on Morfa Rhuddlan the risk of overtopping from sea and river defences, considered independently, soon approaches the 1 in 100 year UK urban standard.

However, we have pointed out to Professor Ron Edwards (NRA Welsh Regional Director) that Morfa Rhuddlan is exposed to at least two more or less independent overtopping risks from sea and river, which in certain places might well be considered to summate to an overall 1 in 50 year risk – possibly greater if the Clwyd and Gele rivers are considered separately or if the risk from rainfall within the Ffynon y Ddol catchment area is also fed into the equation. In reply Professor Edwards gave no direct reply but said that this matter was the subject of present study within the current nationwide NRA study of coastal defences.

In real life, the uncertainty principle remains an inherent feature of flood defence engineering. The putative 1 in 1000 year risk of future breach, suggested in the Councils' review document, might apply for a time to Towyn's section of new sea defences provided it remains 100% perfectly maintained and undamaged. However, the Kinmel Bay section is already 23 years old and perhaps one-third through its useful life. Who in the future is to decide the precise optimum moment for its replacement, and why if not because of manifest decline below the 1 in 100 year standard? The somewhat more sheltered Pensarn section of sea wall is now 150 years old, and so on.....

The point of these remarks is not to impart morbid doubts but a healthily educated realism. At any given time the question that matters is also a difficult one to answer publicly: *what is the strength of the weakest link in the chain?*

As regards survivability the NRA at present seems to have ambivalent roles: firstly in issuing serious flood warnings from time to time; and secondly, as soon as the coast is clear, in reassuring the public and urban planners that the residual risk can once again be ignored. There is, however, increasing public awareness both of the difficulties in assessing residual risk and of the planning implications of global warming.

We feel that consistency can only be restored by applying the marine precedent: the NRA's planning advice in urban areas with a residual flood hazard likely to be (or become) great enough to warrant serious flood warnings should be to be proactive and do everything possible to maintain and/or create survivability.

The NRA claim to have accepted the survivability principle by suggesting that future ground floor levels should be 'as high as practicable'. However, the problem with such a vague approach is that builders are likely to use it as justification to accelerate the process (already shown at Kinmel Meadows, the Benfield Estate, and elsewhere) of infilling entire developments including drives and garden areas to a level perhaps 0.5m above that of the natural flood plain – this reducing reserve capacity in the case of inundation.

The present laissez-faire policy seems to mean that on any part of the flood plain to be developed perhaps 50% of the reserve water storage capacity up to 5.0m above OD may be lost, rather than 10 or at most 15% as would apply if the Maidenhead policy were adopted of building houses with even higher ground floor levels but preserving the intervening natural flood plain. This problem is exacerbated by the relatively much high density of newer housing estates compared to the older properties they adjoin - or may almost surround.

We would urge the NRA in Wales, like the Thames Water Authority (whose active co-operation was essential for the success of the Windsor & Maidenhead development control policy), to show greater all-round planning concern in relation both to past actions and potential future scenarios.

In particular, it needs to be appreciated by NRA that their action in raising the northern embankment of the River Gele in 1971 – a measure justified by the need to control the flood risk from that river – nevertheless halved the available flood plain area in 1990, probably doubling flood levels on many populated parts of Morfa Rhuddlan during the recent inundation from the sea.

It follows that the remaining parts of Morfa Rhuddlan simply cannot be treated as if they were unrestricted in capacity when they so plainly are not.

Finally, we urge the NRA to apply to upgrade pumping stations so that they can continue to drain during and immediately after flood events. By itself we recognise that this is not a complete answer to the survivability problem. That is not the point. The point is that lead times would be extended, safety margins increased and damage appreciably reduced in the event of prolonged or repeated flooding - as in the cases both of Towyn 1990 and Windsor & Maidenhead 1947 & 1974 – and all this at very little extra cost. Residents both need and deserve the reassurance that another weak link in the overall survivability chain, so obviously identified in 1990, has been properly dealt with.

3.4 THE LAND AUTHORITY FOR WALES

Although the LAW has not yet declared its hand publicly, privately officers have said that a decision has been made in principle that new planning guidelines are needed and that in general terms the survivability features suggested by the APCSC are sensible and could assist in restoring sales confidence for new housing estates. Meanwhile we have introduced LAW officers to the Windsor & Maidenhead flood plain development control policy.

In the absence of an agreed policy involving the Councils and the NRA, LAW could (and might well) impose its own planning code on builders. However, although LAW owns a very large part of all the green field land within the approved urban areas, it does not own it all.

Taking the Windsor & Maidenhead precedent would mean comprehensive study of all planning options, starting from the reasonable proposition that ideas and resources should be pooled between the different authorities with the aim of reaching agreement via shared efforts to achieve the best reasonably attainable end result, even if from the start this is understood to be likely to represent a compromise by all parties.

3.5 WHOSE SURVIVABILITY?

The Councils have asked for the planning opinions of present residents. We welcome this opportunity. However, we also feel that the priority planning viewpoint, so far as is reasonably predictable, must be that of future generations.

It is uncomfortable but necessary to allow for the very long term scenario, already extant in several parts of East Anglia, when present UK urban flood risk standards may no longer be practically attainable.

5. 'MATTERS FOR FURTHER CONSIDERATION'

The first draft of the Councils' review document listed six specific matters for debate and we have considered these as follows:-

5.1 Moratorium to be extended or reduced? Our principle concern is that the moratorium period be *used*, not just to upgrade defences and drainage but also to set in place robust planning policies which, because they have taken forward-thinking account of the survivability issues, do not have to be revised in 10-20 years' time when any mistakes would be both more obvious and less rectifiable. Proactive policies are far more likely to generate sustained, steady confidence in the area than backward-looking ones which pretend that because the worst effects of global warming are perhaps for the next generation but two or three we have no duty to adapt and anticipate.

5.2 Comprehensive survey to limit development in low-lying areas? The survivability issue is implicit in this question. A flood plain contour map could be used as a general aid to clear thinking about how development, both present and proposed, affects the water flow and storage characteristics of each flood plain compartment under various flood scenarios. However, to be most useful contours would have to be much closer than 0.5m. Many apparently isolated 'low spots' are actually parts of finger-like natural tidal drainage channels which preceded, but often run parallel with, the 1974 ditches.

For example, the Kendal Road/Old Bodelwyddan Avenue area of Kinmel Bay is an example of one of the lowest parts (3.3m above OD) of Morfa Rhuddlan. Completion of Whelmar's Kinmel Meadows Estate along present lines will tend to accentuate the tendency demonstrated in 1990 for intrusive flood water from the Clwyd River's west bank to be displaced onto and trapped in this area. As sea levels rise it is reasonable to speculate that the high tide water table in such an area will approach ground level sooner than in neighbouring, somewhat higher areas. Already, in places the foul drains and sewers are uncomfortably close to ground level. As the existing 18 acres of Kinmel Meadows that has already been built-up feeds into these sewers, it would seem to residents that this has added to the existing frequent problem of bad odours at high tide. It is unclear what improvements if any are attainable. The potential for claustrophobia is accentuated since alternative exits cannot be provided for the remaining, as yet unbuilt 11 acres of the Kinmel Meadows Estate.

We agree with the Councils that apparently small differences in height are important in a flood risk zone. But height is relative. If opinions are seriously being sought concerning the possible exclusion from future developments of marginally low areas, there has surely also to be a duty to weigh seriously the long term interests of residents of already built-up areas.

Height above OD is not the only criterion that might justifiably limit future development. The width of the flood plain opposite any potential point of breach is also important, and this becomes substantially less towards Belgrano and Pensarn (see Fig. 1).. Thus the open space between the two Benfield Estates in Pensarn and Belgrano, though in itself not particularly low, because of its position seems desirable to preserve. As demonstrated in 1990, because of the building up of the northern embankment of the River Gele, the free flow eastwards or westwards of water along the urban parts of Morfa Rhuddlan has become potentially more important in limiting water levels opposite any particular point of a possible future breach. The proposed Gors Road development in Towyn is midway along the length of this northern half of the flood plain (see Fig.1). It seems particularly important to residents of Pensarn and Belgrano that any development is designed to minimise the impedance of water flow from a possible breach at the Pensarn end of the sea defences.

These examples serve to illustrate the type of *dynamic risk analysis* that we think is desirable. In this respect, contour mapping seems only part of what is needed. Apart from the Park Avenue and Gors Road Estates (already approved) and the land exchange proposed recently by Whelmar to help solve the Kinmel Meadows problem, it seems extremely doubtful if major new urban areas should or could ever be given approval within Morfa Rhuddlan.

5.3 Encouragement for conversion of existing bungalows? In principle we support this suggestions for the reasons already given. However, for many present owners any further alterations would be a sensitive matter. Any organised programme of conversion could perhaps best be dealt with and explained to the public as a long term upgrading measure. An overall feasibility study would be essential as a preliminary. In some areas (e.g. the Lon-y-Cyll area of Pensarn) conversion would be very easy as roof space already exists. In others (for example Sandy Cove) technical difficulties do exist and help converting loft space might best be given as and re-roofing was being done: many of these bungalows seem due for re-roofing perhaps within 10-20 years.

5.4 Embargo on new bungalows without first floor access? We advocate this to be the right course for the reasons given fully in Section 3.

5.5 Solid concrete foundations? These should be mandatory. Bitumen or other water-repellant floor surfaces would also be very practical.

5.6 Developers to be notified? If any forms of planning control are to be applied it is imperative that the reasons are thoroughly documented and clarified both to the builder and to the Welsh Office – likely to be the first port of call in dispute.

6. SUMMARY

We reiterate that, although this group is grateful for the opportunity to express its opinions, the priority planning viewpoint must be that of future generations so far as it can be reasonably foreseen – i.e. at least 75 years.

Alongside the All Party Commons Select Committee recommendations as we see they should be interpreted, we feel strongly that the principles of the Windsor & Maidenhead Flood Plain Development Control Policy are thoroughly sensible and could easily be ‘adapted and adopted’ for the remaining parts of Morfa Rhuddlan already approved for urban development.

7. REFERENCES

1. Third Report from the Welsh Affairs Committee of Session 1989-90 on the breach of the Sea Defences of 26th-27th February along the North Wales Coast. House of Commons Paper No 426.
2. Colby J. Policy for the Control of Residential Development in the Flood Plains of the River Thames and the River Colne, 1982. Royal Borough of Windsor and Maidenhead.

