An investigation into the technical issues related to ‘do float’ and ‘can float’ homes

Local Plan for the Broads

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Contents

1 Introduction

As the Local Plan for the Broads is reviewed, there is the opportunity to consider new areas that it could cover and address; buildings that do float or can float is one of those areas.

This type of building is new to the Broads, so this paper looks into the technical issues to consider relating to buildings that do float or can float.

A lot of this work is based on and expands on the thesis completed by a former colleague at the Broads Authority: "Can Floating Buildings Provide the Resilient Communities Needed in Cities?" By George Papworth, 2017 – from now on referred to as 'the thesis'.

2 Different types of floating or can float buildings

We have identified 5 categories of floating or can float buildings. Category A is already addressed in the Local Plan for the Broads when relevant to planning. The aim of this note is to discuss category D and E. The categories are as follows:

2.1 Category A: Navigable boats that are lived on.

These are boats that are self-propelled and not fixed to any one location. Locally, these are also called live-abords. They can use residential moorings and occupants would have a base to moor the boat whilst being able to go travelling, ultimately returning to the same base. The Local Plan has a policy relating to applications for these schemes (residential moorings), as well as allocates land for such schemes. Other users are continuous cruisers, who navigate the Broads (and potentially other waterways) on a continuous basis. They do not have a permanent base on the Broads. These people tend to cruise around the Broads and moor at short term moorings.

2.2 Category B: Boats that are not navigable – houseboats.

The classification of houseboats is the one that currently benefits from a definition under the British Waterways Act 1971, which considers a houseboat to be 'any boat or barge or any vessel or structure used or intended to be used for human habitation, but does not include any boat, barge, vessel or structure which is used for navigation'. The difference between a houseboat and a building on a raft or pontoon (Category C) was given consideration in East Staffordshire (26/03/2007 DCS No 100-048-045), where although the use of the word 'structure' was unclear it was determined that there was a considerable difference between a boat designed or converted into residential accommodation and a flat pontoon on which a timber chalet had been erected. Therefore, houseboats can be further defined as being either purpose-built boats for residential use, or boats that have been converted or adapted internally for residential uses, like a former barge; in both cases they can no longer move under their own power and would be semi-permanently attached to the bank via services.

2.3 Category C: Buildings on rafts/pontoons.

Unlike Categories A and B, these are not purpose-built boat structures, but are in the form of an adapted, commonly non-floating structure, like a caravan or a shed, placed on a floating raft or pontoon.

They would be considered a vessel under the Broads Act 2009, but that would not make them exempt from planning control.

Under existing case law, the size, level of permanence and physical attachment would determine whether they were considered operational development. However, no one factor is considered decisive (APP/E9505/C/10/2134003 & 2134010).

In the Broads, these are generally not supported as they can have landscape impacts. But the Local Plan says that such schemes will be considered on a case-by-case basis. And whilst the residential moorings policy does not necessarily relate to these schemes, the criteria within that policy will be of importance when considering such schemes. See Appendix 3, Appendix 4, Appendix 6 and Appendix 8.

Buildings on pontoons, near Beccles (Broads Authority, 2016). These have been replaced and this website shows images of the current buildings on pontoons: Stay in Beccles, self-catering accommodation — Hippersons Boatyard.

2.4 Category D: Do float buildings.

These are purpose-built structures, but not boat structures. They are similar to can-float (Category E) in that they would typically be fixed in one location by piled supports with no intention of being navigable, but the key element is that they are designed to float for the majority of the time. Additionally, they can be/have:

- **attached to piles**. Would not move along the waterbody. Would float up and down with the tide but are attached to piles in the river with no technical or mechanical involvement.
- **mechanical structures**. These are more technical with mechanical structures that aid the building to move up and down with the tide.

Do float homes in Ijburg, Netherlands (Keiren, 2016)

2.5 Category E: Can float

These are structures that are predominantly built over dry land and as a form of flood resilience are designed to float only during a flood event. They are able to float if needed. The typical form of construction utilises a watertight basement, which acts as a flotation chamber, with the structure kept in position by piled support. Therefore, by design they are never intended to move on the water from their fixed pile location. Also see Appendix 5.

Can-float home in Maasbommel, Netherlands (Keiren, 2016)

2.6 Key message

There are 5 types of floating construction that could be lived on/in. Categories A, B and C (residential moorings, houseboats and buildings on rafts or pontoons are considered to fall outside of the term 'floating building' used in this paper. This paper focuses on Category D "do float homes", and Category E "can float homes".

3 Flood risk

A significant matter to consider when assessing floating buildings relates to flood risk. For both categories of can float and do float homes, we will discuss in this section: vulnerability, sequential test, resilience and access and egress.

3.1 Vulnerability

National and local policy is clear – vulnerable land uses are generally not suitable in areas of flood risk.

Appendix 1 shows the vulnerability classifications and what type of land use falls into which classification. Table 3 of the NPPG shows the flood risk vulnerability and flood zone compatibility.

There is no mention of floating homes/buildings in national policy. Floating homes/buildings are not included in the NPPG vulnerability tables as a separate land use.

The NPPG Flood Risk Vulnerability Classification (see Table 2 in Appendix 1) has a water compatible section. But floating buildings are not mentioned in that section. The only reference to water-based accommodation is for 'Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan', i.e. if it is essential to support the other types of water compatible development listed in the water compatible section.

One approach would be to use the nearest classification:

How the floating building is proposed to be used	Equivalent land use in the NPPG Flood Risk Vulnerability Classification	Vulnerability class	Flood risk vulnerability and flood zone compatibility Flood zone 3a	Flood risk vulnerability and flood zone compatibility Flood zone 3b
Permanent residential or holiday accommodation	Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.	More vulnerable.	A 'more vulnerable' land use in flood zone 3a would need an Exceptions Test.	A 'more vulnerable' scheme in flood zone 3b should not be permitted.

'Can float' buildings may be in flood zone 3b – the functional flood plain. As demonstrated in the previous table, if the nearest classification is used, such proposals would fail national flood risk policy and therefore should not be permitted.

'Can float' buildings may potentially be in flood zone 3a. Dwellings in flood zone 3a need to pass the exceptions test. Such dwellings can be assessed using the usual local and national policies and therefore, it could be argued, don't need to be able to float if they pass all the tests. In that case, the ability to float could be a way of meeting the requirements of the exceptions test and address any residual flood risk. That is to say, the policy approach for dwellings in flood zone 3a seems to already be in place.

'Do float' buildings, however, are more likely to be in the waterbody and the Environment Agency have confirmed that the waterbody is classed as flood zone 3b – the functional flood plain. Based on the 'more vulnerable' classification, they would fail national flood risk policy and therefore should not be permitted.

The Thesis concluded that floating buildings are considered as normal land-based buildings: "Having reviewed the Local Plans of all the LPAs in London, as was anticipated the overwhelming majority of adopted plans have no reference or discussion on floating buildings, as they are still considered a standard land-based construction. This was a key point raised by the responses from the developers in the survey, as they listed that the treating of a floating building as a 'normal' building was a key constraint. It appears that both the existing case law and developers are perceiving floating buildings as a distinct classification apart from 'normal' land-based development. The inevitable policy lag is creating a policy vacuum in which forthcoming applications may need to be determined. The fall-back response from the EA and the LPAs at present is to consider them as 'normal' buildings."

The issue therefore seems to be that there is no distinct classification for can float and do float homes. So, they are considered as normal buildings and not being a type of building of their own – and as a result of the 'more vulnerable classification' they should not be permitted in some flood zones (as discussed previously).

3.2 Sequential Test

According to national policy and guidance[1], the sequential test does not apply to the following applications:

- Located in flood zone 1 (unless the Strategic Flood Risk Assessment indicated there may be flooding issues now or in the future)
- Minor development
- Change of use, although it does apply for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site

[1] https://www.gov.uk/guidance/flood-risk-and-coastal-change#Sequential-Test-to-individual-planning-applications

- Allocated in local plans

The sequential test applies to applications that are not in the list above.

The Flood Risk SPD[2] elaborates on certain aspects of the sequential test to aid its appropriate application in the Broads.

Turning to relevance of the sequential test to can float and do float homes, it is expected that the sequential test will be required as these schemes are likely to be in flood zones 3a or 3b.

The issue arises that the actual use that a can float or do float home seeks to provide (residential or tourism) do not have to be on water or near to water. It can be argued that these land uses can be developed on land. The applicant may *want* to provide these uses through can float or do float homes, but there does not seem to be a *need*. So, it seems that the sequential test could be difficult to pass for can float and do float homes.

Looking at some examples, the scheme in West Berkshire – see Appendix 2, the Local Planning Authority argued that the floating buildings did not pass the sequential test. This case was not tested at appeal. That being said, the building on a raft at Appendix 6 was permitted and seems to have passed the sequential test.

3.3 Resilience

The Flood Risk SPD for the Broads[3] refers to flood risk resilient buildings. This tends to be about reducing the amount of water that enters a building in an area liable to flood, as well as ensuring speedy recovery when flood waters subside. Perhaps not all typical flood resilient guidance is appropriate to do float and can float homes, but fundamentally, the design of the building is important in terms of floating and being able to float.

3.3 Access and Egress

As set out in the following paragraph, schemes for can and do float would no doubt require site-specific flood risk assessments. A key aspect of considering flood risk will be demonstrating that a development will be safe and part of this includes access and egress and ensuring this is in place for the lifetime of the development. The NPPG goes on to say that this is an early important consideration as it may affect the final design.

In the Broads, can float homes would likely have access and egress through the functional flood plain. Do float homes are themselves probably in the flood plain and so at least part of the access and egress would also be in the flood plain.

It will be important to understand the access and egress to an area of lower flood risk, rather than just to/from the building itself.

3.4 Policy Requirements

Any application would need to be accompanied by a site-specific flood risk assessment. They would also need a flood response plan. The sequential test and exceptions test would be

[2] Broads-Flood-Risk-SPD-2020.pdf (broads-authority.gov.uk)
[3] Broads-Flood-Risk-SPD-2020.pdf (broads-authority.gov.uk)

required, as appropriate. The Flood Risk SPD includes guidance and requirements and would be of relevance to any scheme.

3.5 Other important considerations

Flood storage – advice from Norfolk County Council LLFA: 'for the do float house providing there was a suitable range on the dolphins then it would be no different to a pontoon in terms of flood storage. While for the can float there would be a loss of flood storage it should be minimal, although it would need to be proven. For example, dependent on the construction approach would depend on whether water could enter the chamber readily during low return period events. If this is not the case, meaning the dry dock is disconnected from the floodplain then there would be a minor loss of floodplain that would need to be compensated'.

EA considerations – see Appendix 11 for more information, but to summarise the main considerations:

- The nature of the flooding in the proposed location and the impact it could have on the development and its users.
- What needs to be done to ensure it is safe in the event of flooding in the proposed location in the context of its users.
- What needs to be done to ensure the floating structure will be adequately secured in the event of a flood in the proposed location, considering the risk if the proposed development becomes mobile in the event of a flood (for example, if downstream of the location there are bridges, if the structure became mobile it could cause a blockage and increase flood risk elsewhere).
- Purpose-built floating structures that cannot be used for navigation (e.g. floating mobile homes or chalets) are often attached to pontoons and therefore more susceptible to being damaged and swept away in a flood. This places their occupants and others at greater risk.
- Where floating structures are proposed, it is our preference that they should be passive structures rather than require any active intervention by a third party to enable their floating function (e.g. development rises and falls with the water level without any active intervention to enable this to happen).

3.6 Key message

Floating buildings are not treated differently to land-based buildings in national policy. As such, residential in flood zone 3b should not be permitted. In flood zone 3a, residential needs the exceptions test. But the sequential test will be difficult to pass as tourism accommodation and market residential do not have to go on water.

4 Impact on navigation, impact on width of waterway

4.1 Purposes of the Broads Authority

One of the purposes of the Broads Authority is to protect the interest of navigation. There are various byelaws to be aware of and also policies in the Local Plan.

4.2 Policies in the Local Plan for the Broads

Section 23 of the Local Plan is about navigation. Key extracts from the Local Plan are as follows:

SP13 says:

The water space will be managed in a strategic, integrated way and navigation and conservation interests will be maintained and enhanced.

Navigable water space will be protected and enhanced through: i) The careful design of flood alleviation/protection projects; and ii) Avoiding development and changes in land management which are detrimental to its use

DM31 says:

Developments that support and encourage the use of waterways [inter alia] will be permitted (subject to other policies in this Local Plan) provided that they:
a) Would not adversely impact navigation;
b) Would not result in hazardous boat movements;
c) Would not compromise opportunities for access to, and along, the waterside, access to and use of staithes, or for waterway restoration;
d) Are consistent with the objectives of protecting and conserving the Broads landscape and ecology, including the objectives of the Water Framework Directive;
e) Are consistent with the light pollution policy; and
f) Would not prejudice the current or future use of adjoining land or buildings.

As mentioned previously, residential moorings, for navigable vessels that are lived on, is covered in the Local Plan. As part of policy DM37, the impact on navigation is a key consideration.

Further, DM37 directs residential moorings to marinas, boatyards and basins (in certain locations, see later) or in Norwich. The requirement for such moorings to be in marinas, boatyards and basins reflects that these areas are not main navigation channels and that siting residential moorings there would have no impact on navigation. The residential moorings guide[4] refers to certain specific moorings to be permitted for residential moorings or may want an area to be permitted with a maximum number of residential moorings within that area, to reflect the operations of the marina or boatyard or site. The potential to impact navigation would be a key consideration for such moorings in Norwich.

[4] Residential moorings guide (broads-authority.gov.uk)

4.3 Byelaws

The impact of a scheme on navigation is a key consideration for the Broads Authority and there are byelaws to ensure this.

4.4 Key messages

Do float homes will need to ensure they do not impact on navigation. In terms of can float homes, the requirement will be similar as, whilst they will not be on water, they will still need to be designed to ensure their floating mechanism does not cause an impact. Another consideration would be any part of can float homes protruding into or over the water.

5 How water flows around the building

5.1 Summary of research

It is not very likely that the impact of can float and do float homes will become a key issue regarding flow of water in main channels, as the navigation impact is the primary issue. That is to say that if a development were to protrude into the navigation channel, it may not be acceptable due to that particular impact. More generally, something that floats might not affect the flow of water; however, there could be a cumulative impact depending on the infrastructure required, for example if there are a number of piles.

5.2 Example policy wording

Taking an example of policy wording elsewhere in the country, Wandsworth Council's emerging Local Plan policy LP62 refers to 'unacceptable harm to the operation of the river regime'. Following this wording up with Officers at the Council, they said that the phrase, 'unacceptable harm to the operation of the river regime' refers to the pattern of the river's flow over time and unacceptable impacts could involve a significant change in speed or direction of the river as this could lead to erosion or other impacts further along.

5.3 Key messages

It would seem prudent for any policy to address the issue of the potential for impact on the river regime.

6 Connections to utilities

6.1 Examples

Locally, the buildings on rafts at Hippersons Boat Yards do not have gas connections, but water and sewage are supplied via pipes (plastic, semi-flexible) and electricity is via an armoured cable.

The West Berkshire case study at Appendix 2 says 'each property is serviced via flexible pipes to allow continuous connectivity for incoming electricity, water and telecoms and removal of wastes during a flood event'.

6.2 Key messages

Both types of floating homes would rise and fall with the water level, so the potential for such movement will need to be designed in when providing utilities. As is discussed later in the document, in terms of foul water, it is expected (policy DM2 of the Local Plan) that schemes will be connected to a foul sewer unless proven not to be feasible.

7 Construction techniques

7.1 Summary of research

It seems that there are a few different ways to construct can and do float homes. It depends on how the building would be transported to the site and if there is a dry dock present.

The hull could be constructed off site and then floated into position. Or it could be driven from the factory to position; but the width of the roads used to access the site would affect the size of the building. The super structure would then be built on site and a dry dock seems to be a useful feature nearby to help with building.

7.2 Key messages

Anyone proposing a can float or do float home will need to consider how and where the building would be constructed and transported and put into place. This would be considered at the planning application stage.

8 Mortgage and insurance

8.1 Summary

Whilst not necessarily a planning matter, the ability to secure a mortgage may be a key aspect that needs confirmation before building a floating home.

Insurance tends to be a marine-type insurance, but there are examples where floating homes have insurance. The ability to secure insurance may be a key aspect that needs confirmation before building a floating home.

8.2 Key messages

Anyone wanting to develop a floating home, wishing to rely on the building being mortgageable and insurable, will need to seek confirmation in advance. This could affect how the building is designed and secured which may be relevant to the determination of any planning application.

9 Where could can float and do float homes be allowed?

9.1 Policies of the Local Plan

As with all homes, how they are used could vary. Can float and do float homes could be permanent residences (including affordable housing), holiday accommodation or second homes. The related policies in the Local Plan would therefore be of relevance whereby we treat floating homes the same as land-based equivalent:

- For permanent residential, the policies in section 24 of the Local Plan will be of relevance, especially the location criteria of within a development boundary.
- For holiday accommodation, section 22 of the Local Plan is of relevance.
- In terms of second homes, the Local Plan says 'holiday homes that will be occupied as second homes are not considered as holiday accommodation for the purpose of this policy, but as new dwellings'.

Another type of development that has location criteria set out in the Local Plan is residential moorings. The location criterion of the residential moorings policy in the Local Plan, DM37 says '*is in a mooring basin, marina or boatyard that is within or adjacent to a defined development boundary or 800m/10 minutes walking distance to three or more key services (see reasoned justification) and the walking route is able to be used and likely to be used safely, all year round or is in Norwich City Council's Administrative Area'*. There could be potential to use this location criteria within any policy for floating homes.

It should be noted that these policies will be reviewed and updated and potentially amended as part of the new Local Plan, so some elements could change.

9.2 Other considerations

It will be essential that nearby land uses are considered. For example, the amenity issue if proposing such homes in a working boatyard or marina or schemes next to public rights of

way. The impact on navigation would be an important consideration, as discussed earlier in this paper.

Schemes would need to think about whether any placement of floating homes could pose a risk to future restoration projects. If it results in development of part of a floodplain, it may become harder to rewet other parts of the floodplain if it is seen as making those other parts more likely to have higher floods.

9.3 Key messages

Any Floating Homes policy will require location criteria. There are already such criteria for land-based dwellings and residential moorings in the Local Plan that could be used.

10 Costs and viability

10.1 Discussion

The cost of land is a cost factor to consider when planning schemes.

Do float homes are on the water. Parking provision, access and egress elements of schemes will be on land. In the Broads, the riverbed is owned either by the City Council or Crown Estate and some Broads may be privately owner. So, some arrangements would need to be put in place if an applicant wanted to use the riverbed. The financial implications as regards an agreement about the use of the riverbed would probably impact on viability.

Can float homes are in the flood plain, on land, so it is presumed there will still be a land cost to consider. Indeed, the West Berkshire case study at Appendix 2 implies that can float homes cost twice as much to build as land-based homes, which are not in the flood plain.

Policy requirements need to be viability tested during the Local Plan stage. The viability of can float and do float homes could be assessed as a development type as part of that process if a policy was taken forward.

Floating homes will probably still need to meet the various requirements of the Local Plan such as affordable housing and open space provision, depending on scale of the schemes.

10.2 Key messages

It is not clear at this stage how the cost of can float and do float homes, in particular any land cost and any extra construction cost, could impact on viability and therefore policy requirements and planning obligations., If floating homes are taken forward in the Local Plan, the viability work would look into the viability of the policy.

11 Planning related issues/considerations

11.1 Policies of the Local Plan for the Broads

All policies of the local plan would be relevant. For example, buildings would be designed to be energy efficient and water efficient. They would be expected to dispose of foul water up the hierarchy listed in DM1. Depending on scale, they would need to address the requirements relating to affordable housing and open space. Other planning related issues are discussed

elsewhere, such as impact on peat, dark skies, navigation, viability, utilities, design and flood risk, some of which have been discusses in this paper.

11.2 Key messages

Many policies of the Local Plan for the Broads will be relevant and important in considering such schemes.

12 Constraints to can float and do float homes

The Thesis includes thoughts and queries from planning officers and developers about what constraints there could be to can and do float homes. For this paper, the thoughts and queries have been grouped, with commentary provided by the Planning Team, in italics.

- River amenity harm, character and appearance of the area. Design and appearance, appropriateness to character. *These are all important considerations. The importance of design is more prominent in national policy. Impact on the built and landscape character and design have always been important considerations when determining any application in the Broads so, as a Local Planning Authority, the Broads Authority is experienced at considering these issues. Perhaps this is where the location section of this paper, section 9, is of relevance. That is to say that, like residential moorings, floating homes could be in marinas and boatyards.*

- Servicing. *It is presumed that this refers to utilities. This is discussed earlier in the document at section 6. There could be other considerations such as bins, cycle storage, car parking, but these could be provided in the usual way as for land dwellings and residential moorings.*

- Management and operation. *There will need to be an element of ongoing management and maintenance. For schemes for individual floating homes, could the onus be on the owner? Where there are joint elements of a scheme, then there may be some kind of management, similar to flats. This will be for the operator and scheme promoter to consider and put in place.*

- Public access and use, continued waterway access, interference with navigation on rivers; rivers should be for the public to enjoy and floating structures/buildings should allow for enjoyment for all, e.g. for pleasure craft, and not permanent residences. Development of floating structures would limit the useable channel and cause safety issues. Floating buildings would conflict with other water uses, e.g. recreational activities. Obstruction of the waterway. *This is addressed at section 4 where the impact on navigation is discussed. Again, perhaps this is where the location section of this paper, section 9, is of relevance; like residential moorings, floating homes could be in marinas and boatyards.*

- Obstruction of the towpath/adjacent land. *Again, perhaps this is where the location section of this paper, section 9, is of relevance; schemes would not be acceptable where they interfere with towpath and adjacent land or cause amenity issues.*

- Anti-social behaviour. *It is not clear how anti-social behaviour experienced by those living in can and do float homes would be any worse or different to those living in land-based dwellings. Perhaps being located in marinas or boatyards could add greater protection, if any more were needed?*

- Flood/tidal defence harm. *Flood risk, especially if structures become loose during flood event. I would assume that floating buildings are designed to approved standards that could withstand tidal changes. As a flood risk manager, my concern would be both flood risk to the development itself (particularly if residential accommodation) and from the development. Static waterbodies may be more appropriate for floating buildings and these have been common place in places like Denmark*

and Holland. There are examples also in the UK. I would be concerned with potential loss of flood storage or reduction in conveyance, as well as ensuring that occupants of the building have safe access and egress during times of flood. Section 3 discusses flood risk.

- Location. *This is discussed in section 9.*
- Lack of knowledge and expertise of delivering this type of building, lack of specialised contractors/builders to work on water for what needs to be looked at as "normal" houses. *Noted and that may will be an issue.*
- Lack of insurance. *Discussed at Section 8*
- Lack of funding, most in the UK have been self builds. *Noted, but this is not necessarily a planning issue. It would be for a scheme promoter to design and deliver a scheme within their budget.*
- Lack of knowledge and understanding of NPPF. Councils and the EA are very resistant to change even if it is within the rules. The EA treat a floating structure as a normal building. *It is not clear how there is a lack of understanding of the NPPF and national policy as a whole in relation to floating buildings. There is no part of national policy that refers to floating homes, as discussed in the flood risk section 3.*

13 Case Studies

Appendices 2 to 10 inclusive discuss some case studies of the various types of floating buildings around the UK that have applied for permission. This is not every single one – it is a selection that have been identified during researching this paper. The case studies talk about the key issues regarding the applications, in particular flood risk and whether it was permitted or not.

The case studies are:

Appendix 2: Case Study – West Berkshire Council, Theale Lake – scheme involving can float homes. It is important to note that this scheme is on a lake and not a river and that could be why flood risk was not necessarily a main issue. Indeed, concerns about flood risk were not reasons for refusal of this scheme. But the scheme did fail the sequential test, but that was not seen as a refusal reason on its own. It seems that the design and location of the entire scheme as well as ecological concerns and concerns regarding a bridge were the main reasons for refusal. It is interesting that, on demonstrating a safe access and egress and that flood risk would not be increased elsewhere, the EA withdrew their objection.

Appendix 3: Case Study - The Chichester Prototype Note that this looks like it is a building on a raft or pontoon – category C.

Appendix 4: Case Study - Brockholes floating visitor village Note that this looks like it is a building on a raft or pontoon – category C.

Appendix 5: Case Study – replacement dwelling - Amphibious House Note that this is a replacement dwelling, so there is no increase in flood risk. There is a wet dock that can be

flooded when river level rises. Inside wet dock is floating home. Dolphins to guide it up and down. Note that this looks like it is a can float building – category E.

Appendix 6: Case Study - Erection of a single storey, three bedroomed floating house, Worcester. Note that this looks like it is a building on a raft or pontoon – category C. In their comments, the EA seem to remind the Council of national flood risk policy and how this scheme seems to relate to that. Comments also relate to structural integrity of the scheme. The sequential test says 'In this case, the developer's needs are very specific, for a floating house located in the river with two additional conventional residential units. No equivalent alternative is available, and any alternative would necessarily have a similar risk profile'. As noted in section 3.2, this seems to reflect what the applicants wants rather than need.

Appendix 7: Case Study - Ashwicken Lake, West Norfolk This application was withdrawn. Again, this is on a lake and therefore flood risk may not be a main issue.

Appendix 8: Case Study 4 floating holiday pods Note that this looks like it is a building on a raft or pontoon – category C. The EA response confirmed that this lake is flood zone 1 and therefore flood risk is not an issue. This was subject to an appeal, but not in relation to flood risk:

Appendix 9: Case Study: Flag House, Brundall, Norfolk This is a net new dwelling, permitted in 2002, on land that used to flood. It is a can float building, floating when needed.

Appendix 10: Case Study – Eel Pie Island An assessment of the planning applications at the island shows that in the last twenty years, there have not been any net new dwellings, rather replacements dwellings. This could reflect changes to flood risk policy.

14 Conclusion

This paper discusses some topic areas related to can float and do float homes. Those topic areas are as follows, but there may be other topic areas to consider.

- Different types of floating or can float buildings
- Flood risk
- Impact on navigation, impact on width of waterway
- How water flows around the building
- Connections to utilities
- Construction techniques
- Mortgage and insurance
- Where could can float and do float homes be allowed?
- Costs and viability
- Planning related issues/considerations
- Constraints to can float and do float homes

The main constraint to promotion/development of can float and do float homes is that of flood risk as schemes are likely to be contrary to national policy on flood risk. There seems to be no

route through national flood risk policy that would allow for do float and can float homes in flood zone 3b, including the waterbody itself.

As things stand, it is likely that promoting can float or do float homes in the Local Plan will not be possible due to conflict with flood risk policy.

Appendix 1: NPPG Flood Risk Vulnerability Classification

Source: Flood risk and coastal change - GOV.UK (www.gov.uk)
Yellow highlights show reference to dwellings and houses and homes.

Table 2: Flood risk vulnerability classification

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings[5].
- Caravans, mobile homes and park homes intended for permanent residential use[6].
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

More vulnerable

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels[7].
- Buildings used for dwelling houses[8], student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan[9].

[5] It is not likely that floating buildings will be provided as basement dwellings. So, this is not relevant to floating buildings.
[6] It seems that houseboats and buildings on rafts or pontoons used for permanent residential dwellings could fall into this category.
[7] It seems unlikely that these land uses would be provided through the use of floating buildings, so this category does not seem relevant.
[8] This seems the most relevant category for can float and do float homes either used as tourist accommodation or permanent residential accommodation.
[9] It seems that houseboats and buildings on rafts or pontoons used for tourist accommodation could fall into this category.

Less vulnerable

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan[10].

" * " Landfill is as defined in Schedule 10 of the Environmental Permitting (England and Wales) Regulations 2010.

[10] Unless the application for the can float or do float home shows that it is for essential accommodation for staff required by the uses set out in water compatible development section, then this is not relevant.

Appendix 2: Case Study – West Berkshire Council, Theale Lake – scheme involving can float homes.

2a) Link and details of the proposal

16/01240/OUTMAJ | Outline planning application for a residential development of up to 225 homes with associated infrastructure including flood alleviation works, drainage works, new buildings to house sailing facilities with associated access and parking, works to the bridge over the Kennet and Avon Canal, means of access, footways, amenity green space, landscaping and other related works. All matters reserved except access. | Burghfield Sailing Club Hangar Road Sulhamstead Reading Berkshire RG7 4AP (westberks.gov.uk)

The scheme included 24 can float homes (category E) that would look like this, on the edge of the lake.

The can float homes were proposed to be around the lake. See following plan.

2b) Extracts from the Design and Access Statement.

The 24 Can-Float homes along the edge of Theale Recreational Lake are at an extremely low level of risk as the 'heel' of each property is in Flood Zone 1 (with permanent dry access all the way to the M4 motorway) and although the 'toe' of the building is in Flood Zone 2, the house will safely float in the event of any severe flood event. This minor increase in risk is too small to be quantified, so it is a 'philosophical' risk rather than a relevant tangible risk.

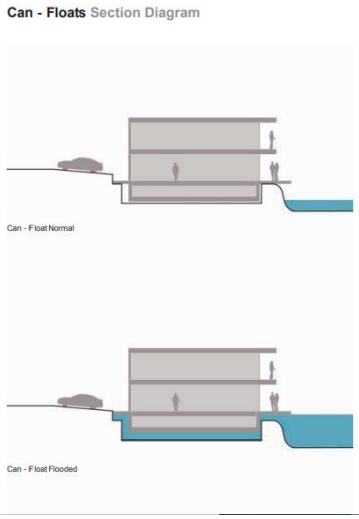
The area allocated for the can-float homes is also predominantly located in Flood Zone 1 with a very small area categorised as Flood Zone 2. For this reason, the can float homes are best suited in this low risk flood zone as the homes are able to rise and fall with changing flood levels.

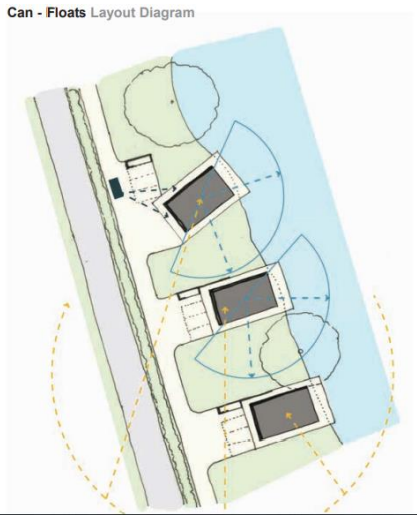
The area allocated for the can-float homes also remains predominantly in Flood Zone 1 with a very small area categorised as Flood Zone 2. For this reason, the can-float homes are best suited in this low risk flood zone as the properties will always remain above the modelled top water in the lake.

The Can Floats ground floor finished level AOD will be set so that the property will float at a minimum of a 1 in 20 year flood event, equivalent to a 5% Annual probability that it will need to float (5%AEP).

The floatation is achieved with 3 core components.

1. A precast concrete basin on piled foundations provides a solid base for the building to sit on and transfer its loading to the ground. It secures against any lateral building movements as the Can-Floats are not directly connected to the ground. The basin's principle objective is to provide a controlled environment for flood water to flow under and surround the basement structure containing the buoyancy and uplift capabilities.
2. A basement structure or Platform is constructed using a system called Concrete-Encased Expanded Polystyrene Floating Platform. Expanded Polystyrene (EPS) Blocks, which contain 98% air and the closed cell structure of their foam pearls, provide a very high buoyancy capability. The EPS Blocks are surrounded by a lightweight, reinforced concrete coating for protection and longevity. There is an internal substructure between the EPS blocks of either beam and block or columns and a reinforced concrete slab is poured on top to complete the Platform. This Platform provides a solid raft slab for the house to be built off and the floatation and buoyancy capabilities in one structure.
3. Guide piles limit the movement of the Can-Float during a flood event to just rising and falling. Around the guide piles are spring loaded rollers within a locating collar inside the platform to ensure smooth vertical movement. For each Can-Float two piles are placed on diagonally opposite corners. These piles extend up from the foundation and the Basin structure, through the Platform and above the ground floor finished floor level. They can either be external to the building envelope or hidden within the wall build up.





Each property is serviced via flexible pipes to allow continuous connectivity for incoming electricity, water and telecoms and removal of wastes during a flood event. Low level street lighting in bollards/ posts along the private access road will provide illumination to the road surface and safety lighting, without significant light spillage.

The Can-Float homes are proposed in 2 Sizes; 4 Bedroom, 2 storey, 2000ft2 and an extended 4 Bedroom, 2 storey, 2500ft2, providing options for different households with choices for end user configurations being possible through bespoke ground floor layouts. Both variants will have a deck that runs around 3 sides of each home; the entrance and open façade sides will be

1500mm wide; at the lake side it will be 3000mm, partially overhanging the water. This is formed as part of the floatation platform. Each Can-Float will be approximately 6.5m tall from the finished floor level of the deck to top of roof.

2c) Case Officer's Report and the can float homes element of the scheme
The case officer's report said the following about the can float homes.

5.2.11 Furthermore the can float homes along the lakeside edge, by reason of their presence, number and associated domestic paraphernalia will result in an urbanising impact on the lake. Currently undeveloped and rural in its appearance, the new houses span the western edge of the lake to create a string of development changing the character of the water's edge. The buildings will sit prominently on the lake and furthermore the loss of trees and shrubs as a result of this development will further increase the visual impact arising from this part of the development. These views will be obtained principally from PROW BURG/28/1 and glimpses from the M4. Filtered views will be obtained from Hanger Road and increasingly prominent within the winter months. Again, the number and size of the buildings will increase the visual impact of these structures eroding the rural character of the area.

5.4.13 1 On the basis that the can-float homes are primarily within flood zone 1 with only the toes of the building within flood zone 2. This is however contrary to the information shown on sketch plans FP#001 to FP#008 dated 2 November 2016 which were submitted as part of the application. These show that the can-float homes are located in areas of medium and high probability of flooding as indicated by the EA flood maps for planning.

5.4.21 **To conclude, it is considered that the proposed siting of the 24 can-float homes fails to meet with the sequential test.** The 201 homes are in flood zone 1 and as such the sequential test is not applicable and the new sailing club buildings meet the test. **The siting of the 24 homes however runs contrary to the precautionary principle of national planning policy however it is recognised that the applicant has demonstrated that safe access into and from the site can be achieved and the EA have confirmed that the proposals would not increase flood risk elsewhere thus removing their original objection to the scheme. Furthermore, the scheme would deliver some incidental off site benefits reducing flood depths on the local road network. In light of these factors, it would not be possible to demonstrate the harm arising from the development and as such the failure to meet the sequential test would not constitute a refusal reason on its own.**

5.7.4 In accordance with advice from an external consultant the Council are satisfied that it has been demonstrated that the scheme would be unviable were a full, policy compliant contribution (40%) to be made. The viability of the scheme is impacted on principally by 'abnormal' site works/facilities to include costs relating to the sailing club, new bridge, flood prevention, nature conservation and the cost of building the can-float homes which is estimated at around twice the cost of a conventional property.

2d) Decision by LPA

The application was refused. Here is the decision notice. The main reasons for refusal seem to be:

- This is not a genuinely plan-led allocated site, nor is it previously developed land, as sought by the statutory development plan and the NPPF. The development of this site for 225 dwellings acutely conflicts with the aforementioned policies, and would not contribute to a sustainable pattern of development in West Berkshire. Moreover, the development would harm the landscape character of the area, have adverse visual impacts and have significant negative impacts for biodiversity and on the highways network alongside significant harmful impacts on the catchment primary school Burghfield St Marys.
- The development fails to have due regard to the sensitivity of the area to change. The introduction of new housing in this location and at the scale proposed will appear alien within the landscape and undermine the rural qualities of the area.
- Insufficient information has been provided to determine whether roosting bats will be impacted by the proposals.
- Insufficient information has been provided at this stage to demonstrate that the net loss of up to four nightingale territories can be adequately compensated for by the provision of retained and managed habitat
- The proposed development includes the provision of a new canal bridge which is sub-standard in respect of design that will require repairs and maintenance at an unacceptable level of frequency, which would adversely affect road safety and the flow of traffic.
- The application fails to demonstrate that the impact of the development on primary school provision can be mitigated.
- The development fails to provide a planning obligation to deliver necessary infrastructure, mitigation and enabling works (on and off site), including: affordable housing, travel plans, highway works to include the new bridge, public open space, community bus service, a satisfactory solution to the impact on primary school provision.

2e) Appeal

The decision was appealed. The appeal was later withdrawn.

2f) Commentary

It is important to note that this scheme is on a lake and not a river and that could be why flood risk was not necessarily a main issue. Indeed, concerns about flood risk were not reasons for refusal of this scheme. But the scheme did fail the sequential test, but that was not seen as a refusal reason on its own. It seems that the design and location of the entire scheme as well as ecological concerns and concerns regarding a bridge were the main reasons for refusal. It is interesting that, on demonstrating a safe access and egress and that flood risk would not be increased elsewhere, the EA withdrew their objection.

Appendix 3: Case Study - The Chichester Prototype

Floating Homes Limited completed the build of their first prototype buoyant building designed by Baca Architects in 2017. Inspired by canal living, the 'Chichester' model[11] is not a houseboat but a house that floats.

The prototype is situated on a residential mooring on a disused canal which runs alongside Chichester Marina.

The water level can vary by around 40cm so the water and electricity are supplied via flexible pipes and cables. The sewage is pumped out of the hull via another flexible pipe into the mains system running alongside the canal.

The floating home was built in two separate parts, the floating foundations and the modular superstructure and then assembled on the canal. The floating foundations is an open boxed shaped hull with 15cm thick sides and base made from reinforced concrete weighing over 40 tons and is zero maintenance. The modular superstructure was constructed using lightweight structurally insulated panels (SIPS) in a factory.

This version has mechanical ventilation with heat recovery (MVHR), underfloor heating and a solar PV system which supplies the hot water via a Sunamp heat battery.

The cladding is western red cedar that has been treated to create a uniform silver grey finish. The build takes around six months to complete and has a starting price of £200k plus VAT (no vat payable on residential) which includes the interior fit-out but excludes delivery and mooring fees. The 'Chichester' offers an appealing lifestyle in either urban or countryside settings.

It should be noted that the owner pays rent to the marina in which it is situated.

Commentary: Note that this looks like it is a building on a raft or pontoon – category C.

[11] The Chichester | Baca Architects (www.baca.uk.com)

Appendix 4: Case Study - Brockholes floating visitor village

Visit | Brockholes Nature Reserve

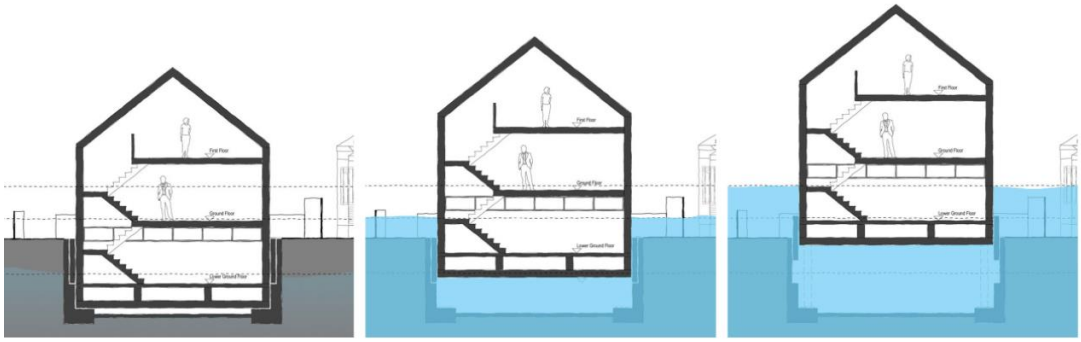
The innovative platform is a cellular reinforced concrete structure with polystyrene infills. Special measures have been taken in line with the sustainable objectives of the project, including the use of 4800 tonnes of recycled concrete and environmental management. Floating on the largest lake on the site, the pontoon will support a cluster of 5 buildings forming the new landmark Visitor Centre and bringing the experience of the wetland habitat closer to the visitors.

Commentary: Note that this looks like it is a building on a raft or pontoon – category C.

Appendix 5: Case Study – replacement dwelling - Amphibious House

More details can be found here: Amphibious House | Baca Architects.

A small island located on the River Thames, in south Buckinghamshire, is home to 15 houses. The houses, which were mostly built before the 1950s, are typically raised about 1 m off the ground on timber piles to protect them from flooding. At the time of construction, they were only built high enough to protect them from regular flooding rather than extreme flooding. When the owners of one house on the island plan to be built their home they discovered that the floor level would need to be raised a further 1.4 m above the ground level to cope with the predicted extreme. This would've resulted in a house with its ground floor elevated 2.5 m above the ground. The house was also subject to Conservation and Environment Agency rules. The solution was an amphibious house, a building that rests on the ground when conditions are dry but rises up in its dock and floats during a flood. The house itself sits in the ground and the floating base is almost invisible from the outside. The ground floor of the house is raised above the ground by less than 1 m rather than by almost 2 m as will be required if it were not amphibious. This approach meant that the 225m² three-bedroom dwelling could be constructed over three floors in the place of a single-storey 90m2 house without significantly increasing the ridge height.



Commentary: Note that this is a replacement dwelling, so there is no increase in flood risk. There is a wet dock that can be flooded when river level rises. Inside wet dock is floating home. Dolphins to guide it up and down. Note that this looks like it is a can float building – category E.

Appendix 6: Case Study - Erection of a single storey, three bedroomed floating house, Worcester.

6a: Details

Location: NORTHWICK MARINA, NEWEYS HILL, WORCESTER, WR3 7AL

Link to application: [Planning application: P17E0114 - Worcester City Council]

Full planning permission granted in 2017.

The 145m² oval bungalow will float permanently on the water, attached to the bank by two support piles. Attached to a residential mooring.

FLOATING HOUSE VISUAL (PP-05832322)

Visual of Floating House from River eastern side footpath bridge

6b: Extracts from the application documents:

The planning application ensures that the mooring piles will be of sufficient height to cope with the flooding well past the 100 Year + Climate Change level so there is no risk of the vessel breaking loose.

Site Specific Flood Risk Assessment:

- The primary development on the site is the floating house. This does not require a set finished floor level as it will move up and down fixed mooring posts as the river level changes, thereby mitigating the risk of internal flooding posed from rising flood waters.
- Due to the floating nature of the house and the raised level of the bungalows on the site there is no requirement to include flood resistant measures at the site.
- Due to the floating nature of the house and the raised level of the bungalows on the site there is no requirement to include flood resilience measures at the site.
- For all the proposed developments on the site there will be safe dry access at the 1% + CC AEP level of 17m AOD. The two bungalow developments will be located above the 1% + CC AEP flood level and the floating house will include a floating walkway that rises with the house during raised water levels.
- The only development in the floodplain is the floating house which will float above the rising flood waters. Therefore, there is no requirement to provide any floodplain compensation as a result of the development.

6c: Extracts from Committee report

8.57 The National Planning Policy Framework 2012 and SWDP clearly states that development within flood zone 3b is unacceptable for a proposed residential use which would be considered more vulnerable. However, that guidance fails to take into account development which is proposed to work with the natural changes in the river levels and responds to these circumstances as the proposed floating house would do.

8.58 However, there is limited evidence to profoundly show that the floating house could withstand the stresses and strains of the impact of a flood or flood debris. There has been limited evaluation of what these would be, with an intention to design to meet the circumstances once permission is given. However, this matter could be resolved within a condition providing that the design does not alter significantly as a result of this understanding of the site.

8.59 The existing policy position is a significant material consideration in this circumstance and I consider the occupation of the site in a residential capacity has been established. Whilst the houseboat would differ from a boat with being permanently sited and not able to move in times of flood, nevertheless I consider that this is a design issue which could be resolved.

8.60 I welcome the creative and innovative nature of the scheme and the wider benefits it would enable within the site and the occupation of the site in such a bespoke manner which would have a significant positive on the site and the biodiversity of the site.

8.61 Whilst the assessment is not an exhaustive list of all policies that are potentially applicable to this site, it seeks to address how the proposals respond to the key planning criteria in the planning policy framework against which the planning application will be determined. Whilst the type of development is unable to meet the requirements of the Green Space policy SWDP 38 I believe that the level of improvement in the natural environmental qualities of the site from the existing position and considerable and ought to be given due weighting.

8.62 Furthermore, the low quality assessment of the site in terms of the impact on the Riverside Conservation Area and the biodiversity within the vacant site can be significantly improved to add benefit beyond the site. The built form has been designed to address the site and to improve the relationship to the riverside, the bespoke design would add visual interest along the riverbank and the improvements to the riverbank to the benefit of members of the public using it.

8.63 Should members feel that conditions could be drafted to suitably ensure the structural capacity of the floating house can be achieved then this could overcome these reservations. There is a cautious recommendation for approval with full technical and structural assessment required. This will most likely require an expert opinion to confirm whether the proposal has been suitability designed to withstand the natural changes in the site from water changes. In this regard, a fresh planning application may be required should this result in the need for additional structural engineering works beyond the scope of those shown on the submitted plans, which would need to be assessed on its individual merits without prejudice to any decision made by the Planning Committee on the current application.

6d: Commentary

Note that this looks like it is a building on a raft or pontoon – category C.

In their comments, the EA seem to remind the Council of national flood risk policy and how this scheme seems to relate to that. Comments also relate to structural integrity of the scheme.

The sequential test says 'In this case, the developer's needs are very specific, for a floating house located in the river with two additional conventional residential units. No equivalent alternative is available, and any alternative would necessarily have a similar risk profile'. As noted in section 3.2, this seems to reflect what the applicants wants rather than need.

Appendix 7: Case Study - Ashwicken Lake, West Norfolk

Planning application details and link:

[21/00262/FM | Proposed construction and operation of an eco-leisure and tourism facility comprising holiday lodges, clubhouse and spa, boat house and jetties, staff accommodation with other ancillary development including access road, car parking, electric vehicle charging points, outside recreational facilities, follies, renewable energy generation, site security measures, drainage, hard and soft landscaping and biodiversity enhancements together with highway improvements to East Winch Road, Church Lane and Ashwicken Road and temporary construction access route. | Ashwicken Lake Church Lane Ashwicken Norfolk (west-norfolk.gov.uk)]

EDP article:

[Plans revealed for Ashwicken Lake in Norfolk | Eastern Daily Press (edp24.co.uk)]

The proposal is to create the "*Ashwicken Lake Wellness Resort*" at the site of the Ashwicken lake, to the south-west of the Ashwicken and immediately east of Church Lane. The proposals are discussed in various planning documents, including the Design and Access Statement – prepared by Baca Architects.

Key elements of the proposal include:

- A Clubhouse and Spa with a range of facilities – floating on the lake;
- Static and floating lodges along sections of the lake shoreline – single storey;
- Static and floating villas on the lakeside edge – two storey;
- Treehouses located in the northern part of the site – two storey;
- Flatted units on the "Water Lily" floating island – two-storey;
- Follies – themed and recreationally functional;
- Various recreational and wellness facilities;
- Other infrastructure to support site operations – including a solar array and an on-site sewage treatment works.

The design takes careful account of various constraints, including:

- The lake itself – various opportunities and constraints;
- 123kV overhead electricity cables crossing the centre of the site;
- A gas pipeline located within the site, close to its southern boundary;
- Flood risk issues – discussed in this document;
- Other environmental constraints.

The on-site accommodation comprises of static and floating lodges and villas, and tree houses. At the heart of the development are the "Floating Clubhouse and Spa" and the "Water Lilly PADS" - a floating island of apartments. The centrepiece of the development is the Clubhouse and Spa, the UK's first clubhouse on the water.

The "Water Lily" is a floating island of 40-flatted apartments located in the southeast corner of Ashwicken Lake. The Water Lilly provides a contrasting type of accommodation and setting to the private lodges.

The internal road network in the eastern section of the Site will be established first and construction laydown areas located in areas proposed as future car parks. A slipway that will

also be used for future boat use will be constructed at the south-east corner of the lake. The prefabricated floating lodges will be launched from that slipway.

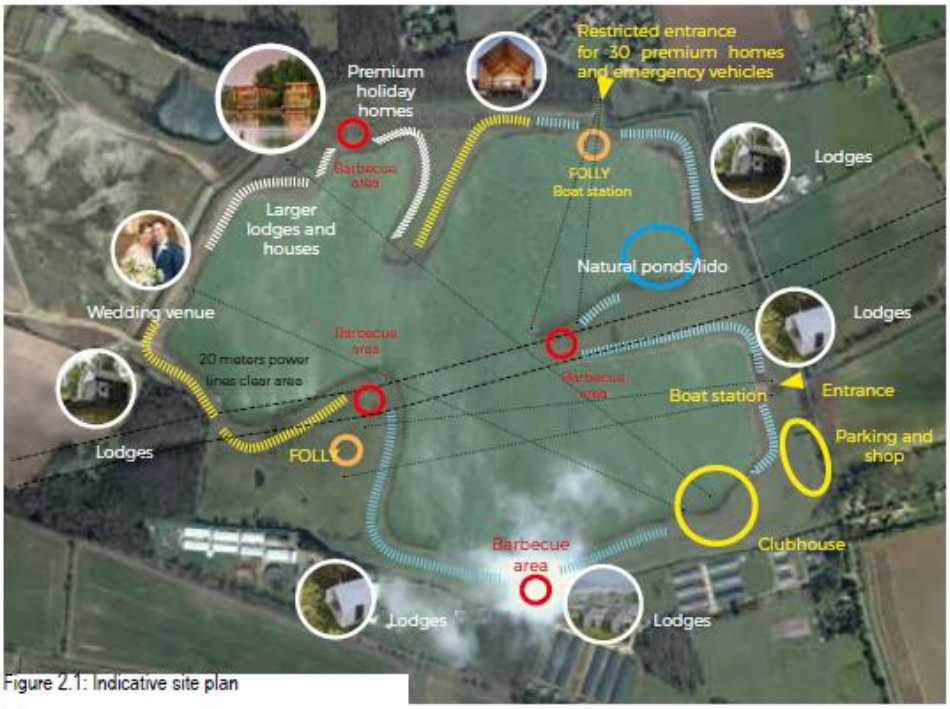


Figure 2.1: Indicative site plan

Figure 2.2: Indicative site layout > Dec 2018.

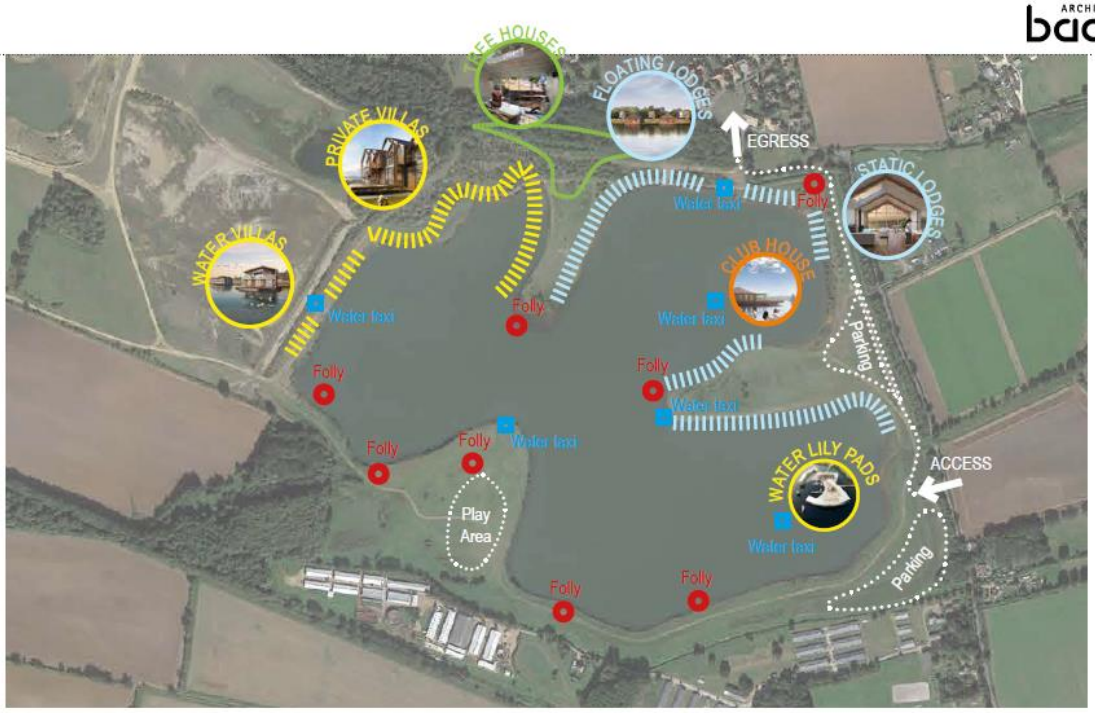


Figure 3.13: Model of Ashwicken Lake with Proposals

Figure 3.30: Lake view of the floating villas

Figure 3.32: Aerial view of the villas and parking

Figure 3.31: Sectional drawing showing higher lake edge, bridge and floating

3.12 > WATER LILY "PADS"

baca

Figure 3.39: Site location plan

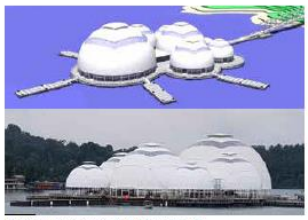


Figure 3.40: Precedent image. Built floating pavilion.

Design

The Water Lily is a floating island of 40-apartmentslocated in the southeast corner of Ashwicken Lake. The Water Lily/Lotus plant whose big leaves float on the water's surface to attract ample sunlight for photosynthesis inspire its design. In this case vistors will use this suntrap for relaxation and well being.

The island floats near eastern edge of the lake and can be easily reached by two bridges and by water taxi. The island is formed from three interlocking leaves of accommodation that enclose a private area of water. The outdoor space between the leaves creates a sunbathing terrace. This composition means that all of the apartments have a clear view out to the lake and that the wrapping nature of the design creates a sheltered and enclosed courtyard at the centre.

Size, scale and massing

The "Water Lily" is a two storey structure that floats on the Lake. The lake embankment is approximately 2.25m to 2.5m higher than the "Water Lily's" primary floor meaning only one storey is visible above the rim of the Lake. We have included site section drawings through the site that show how the bunding and planting at the extremity of the site will further screen potential noise and views.

Construction

The Water Lily will float on an enginneerred interlocking pontoon similar to the adjacent precedent image.The repititous plan means that much of the apartments above can be prefabricated and assembled on site.
(See Section 3.13 > Construction Strategy for further detail)

Conclusion

The Water Lilly provides a contrasting type of accommodation and setting to the private lodges. It is hoped that it's lakeside setting and its iconic form, which is both nationally and internationally unique, and would attract visitors from far afield to holiday at the site.

Figure 3.41: Water Level > Ground floor plan

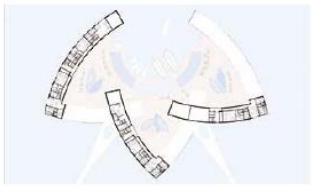
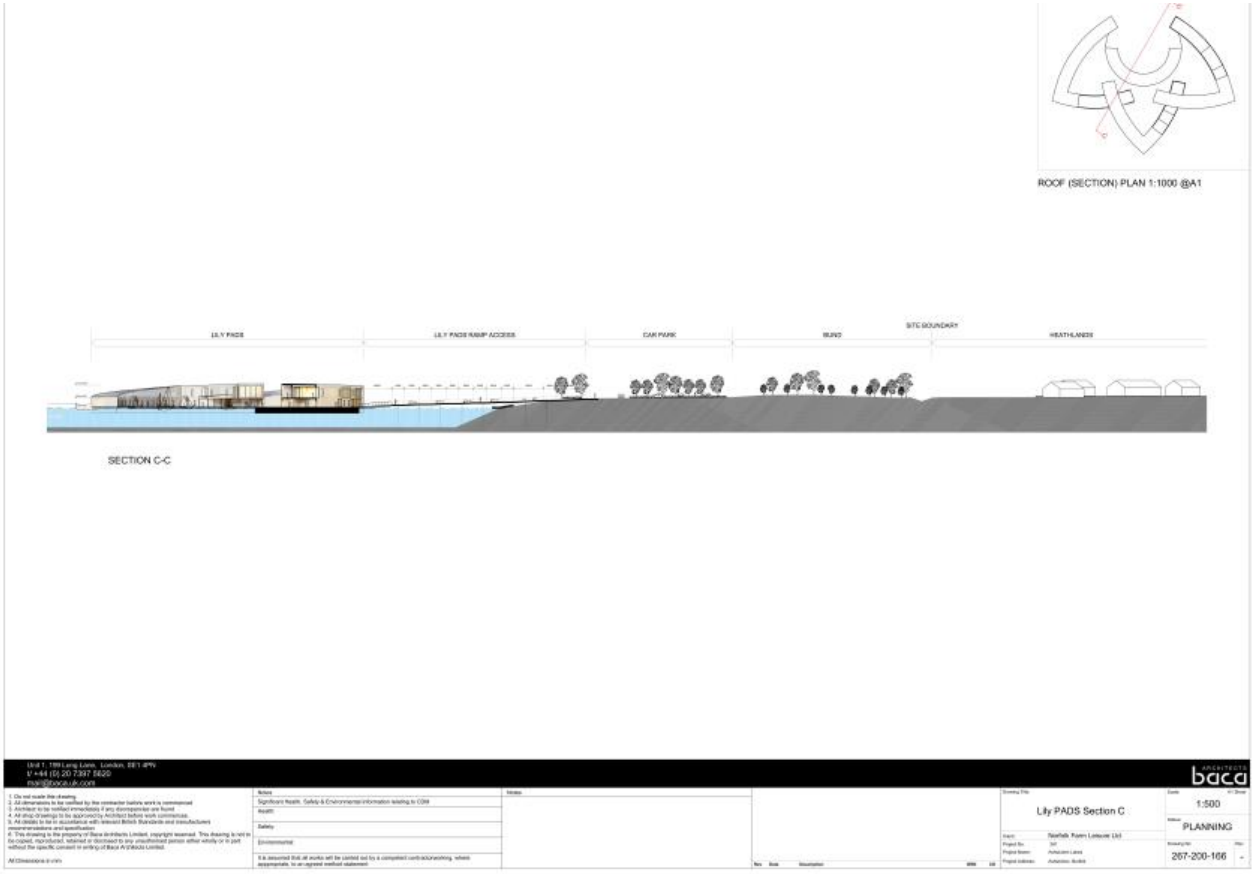


Figure 3.42: Water Level > First floor plan

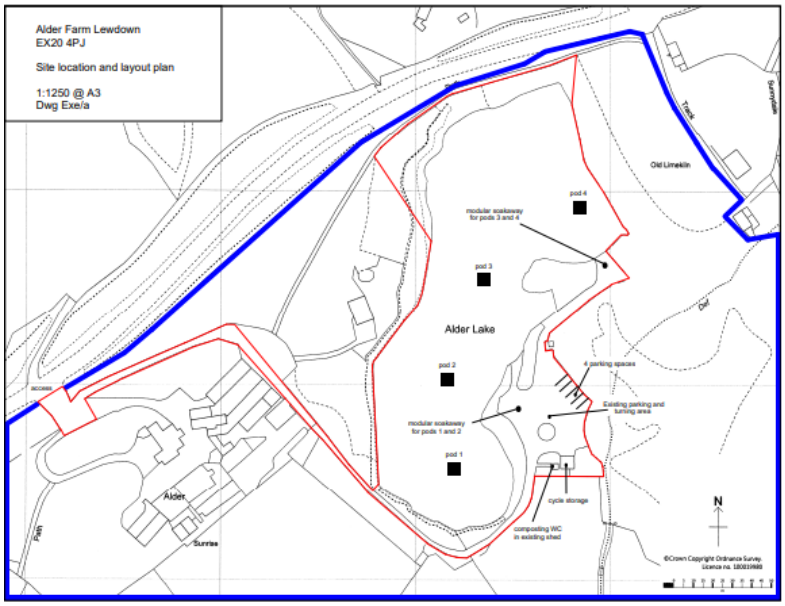


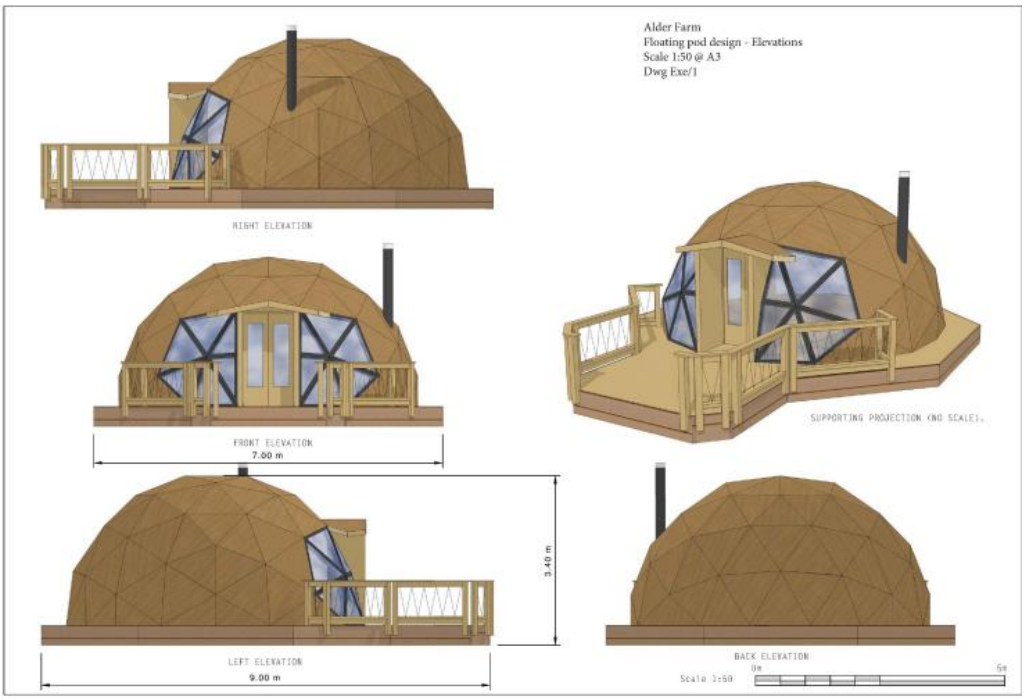
Commentary: This application was withdrawn. Again, this is on a lake and therefore flood risk may not be a main issue.

Appendix 8: Case Study Four floating holiday pods

8.1 Summary

[Planning application: 1028/21/FUL - Planning Page for DEF | West Devon Borough Council (planning-register.co.uk)]





8.2 Commentary

Note that this looks like it is a building on a raft or pontoon – category C. The EA response confirmed that this lake is flood zone 1 and therefore flood risk is not an issue. This was subject to an appeal, but not in relation to flood risk:
[Reference: APP/Q1153/W/21/3278604 (planninginspectorate.gov.uk)]

Appendix 9: Case Study: Flag House, Brundall, Norfolk

Planning Application number: BA/2002/3942/HISTAP

This was a net new dwelling, permitted in 2002, on land and is classed as a 'can float' dwelling. The dwelling has amphibious foundations which would start to become buoyant when the water level was 1 metre over the highest predicted flood level at that time.

Commentary: This is a net new dwelling, permitted in 2002, on land that used to flood. It is a can float building, floating when needed.

Appendix 10: Case Study – Eel Pie Island

This is a private island on the Thames near to Twickenham in the London Borough of Richmond upon Thames. It is accessed by boat or footbridge. There are residential moorings, houseboats and residential dwellings which may float or can float.

An assessment of the planning applications at the island follows. It shows that in the last twenty years, there have not been any net new dwellings, rather replacements dwellings.

Eel Pie Island – assessment of planning applications

Introduction

On the advice of the planning officer at Richmond, I queried their system using 'FUL' so as to not include minor applications. This is as per 14 February 2024. The number at the start of the application number is the year.

Orange is replacement dwelling
Net new dwelling
Extensions

Summary and conclusion

The most recent net new scheme seems to be in the year 2000. Since then, there have been only replacement dwellings and extensions.

Planning summary

Showing applications based on the following criteria:

Of type: **FUL - non householder planning applications (see also COU)**
Where street is **: Eel Pie Island, Twickenham**

List of Cases

• The Haven Eel Pie Island Twickenham TW1 3DY
19/0175/FUL Demolition of existing one-bedroom, two-storey dwelling and construction of one-bedroom, one-person single-storey dwelling.
• Wild Thyme Eel Pie Island Twickenham TW1 3DY
16/0279/FUL Demolition of existing single-storey dwelling and creation of new single-storey, single family residential dwelling.
• Wyndfall Eel Pie Island Twickenham TW1 3DY
16/0280/FUL Demolition of existing single-storey building and creation of new single-storey, single family residential dwelling (Use Class C3 (a)).
• 17 To 18 Aquarius Eel Pie Island Twickenham
15/3071/FUL Roof and ground floor rear extensions to two existing dwellings.

- The Cottage Eel Pie Island Twickenham TW1 3DY

14/4839/FUL
Demolition of existing house and construction of a new 3 bedroom house.

- Shamrock Eel Pie Island Twickenham TW1 3DY

12/2486/FUL
Erection of a previously approved single new dwelling on site of a demolished single dwelling.

- Hurley Cottage Eel Pie Island Twickenham TW1 3DY

11/2039/FUL
Demolition of existing fire damaged property, and the construction of a new dwelling

- Twickenham Rowing Club Eel Pie Island Twickenham TW1 3DY

10/1657/FUL
Alterations including the erection of a two storey extension rear, first floor extension, modifications to external staircase including first floor covered canopy, replacement escape staircase, fenestration alterations, use of flat floor at first floor as a terrace and new balcony on front elevation.

- Syds Quay And Sans Souci Eel Pie Island Twickenham

10/1095/FUL
Demolition of the existing buildings and erection of a 2-storey building to replace Syds Quay comprising 4 no. B1 use class units and 3 no. 1-bedroom flats, one studio and a 2-bedroom dwelling to replace San Souci.

- Woodford Eel Pie Island Twickenham Middlesex TW1 3DY

07/3295/FUL
Demolition and re-building of the existing cottage.

- Sans Souci Eel Pie Island Twickenham Middlesex TW1 3DY

07/2756/FUL
Demolition of existing buildings and erection of 2 storey units comprising six B1 units, unit for river use, chandlers, B1 space, managers flat, boat dock, pontoon and access ramp and new 2 bedroom house.

- Sans Souci (Syds Quay) Eel Pie Island Twickenham Middlesex TW1 3DY

07/0240/FUL
Demolition of all existing buildings on the site. Erection of two buildings of ground and first floor comprising four B1 workshops and four one bed flats over workshops. Erection of a two-bedroom house. Erection of marine engineering building with boat dock and pontoon.

- 14 And 15 Aquarius Eel Pie Island Twickenham Richmond Upon Thames TW1 3EA

04/3442/FUL
Proposed Single Storey Rear Extension To Both Properties.

- Ripple Eel Pie Island Twickenham Richmond Upon Thames TW1 3DY

04/1572/FUL
Demolition of existing single storey dwelling and erection of a new single storey dwelling. Variation of planning application 03/3350/FUL.

- Shamrock Eel Pie Island, Twickenham

03/3386/FUL
Demolition Of Existing Dwelling And Erection Of A New Dwelling House.

- Ripple, Eel Pie Island Twickenham

03/3350/FUL

Demolition Of Existing Single Storey Dwelling And Erection Of A New Single Storey Dwelling.

- Jacob's Ladder (formerly Mascot), Eel Pie Island Twickenham

01/0736
Proposed Ground Floor Rear Extension.

- Jacob's Ladder (formerly Mascot), Eel Pie Island Twickenham

01/0736
Proposed Ground Floor Rear Extension.

- Former Eel Pie Marine Land, Eel Pie Island, Twickenham

00/2086
Erection Of A Two Storey Block Of B1 Workshop/studios And B2 Boatyard With Manager's Flat Above.

- Shamrock, Eel Pie Island Twickenham

00/0086
Demolition Of Existing Chalet And Erection Of New Bungalow.

- Shamrock, Eel Pie Island, Twickenham

99/1356
Demolition Of Existing Dwelling And Erection Of A Single New Dwelling House.

- Aquarius Eel Pie Island Twickenham

99/1342
Ground Floor Extension.

- Shamrock Eel Pie Island, Twickenham

98/2671
Demolition Of Existing Dwelling And Construction Of Replacement Dwelling.

- 12 Aquarius, Eel Pie Island Twickenham

98/2141
Single Storey Rear Extension, New Windows To Side Elevation And Enclosure Screen To Existing Front Porch.

- 1 Aquarius, Eel Pie Island, Twickenham

98/1839
Erection Of A Second Floor To Two Storey House.

- Former Eel Pie Marine Land, Eel Pie Island, Twickenham

97/2560
Erection Of New Buildings Comprising B2 Boatyard With Manager's Flat Above; Two/three Storey B1 Units And Workshops/studio Building (b1c)/b2.

- The Nook Eel Pie Island, Twickenham

97/2470
Demolition Of Existing Timber Framed House And Erection Of New Block And Timber Clad House.

- Former Eel Pie Marine Land Eel Pie Island, Twickenham

97/1652
Erection Of Five, Three Storey Live/work Units Fronting River Thames And Five Single Storey Studio (b1) Units At Rear.

- Hluhluwe Eel Pie Island

97/0154
Demolition Of Existing Property And Erection Of New Single Storey Three Bedroom Bungalow

- Hluhluwe, Eel Pie Island, Twickenham

  96/2362/FUL
  Demolition Of Existing Property And Erection Of New Three Bedroom Dwelling House
- 16 Aquarius, Eel Pie Island, Twickenham

  92/1133/FUL
  Addition Of Second Floor To Existing Two Storey Terraced House.
- 'shamrock' Eel Pie Island, Twickenham.

  89/1786/FUL
  Demolition Of Existing Building And Erection Of A New Detached Two Storey Dwelling.
- 1 Aquarius, Eel Pie Island, Twickenham.

  89/1450/FUL
  Single Storey Rear Extension With New Balcony And Balustrading Above
- 2 Aquarius, Eel Pie Island, Twickenham.

  89/1449/FUL
  Single Storey Rear Extension With New Balcony And Balustrading Above
- Shamrock and adjoining plot Eel Pie Island Twickenham

  88/1412
  Demolition of existing building and erection of two detached houses.
- Min Y Don Eel Pie Island Twickenham

  85/1264
  Demolition, rebuilding and enlargement of dwelling house.
- Min Y Don Eel Pie Island Twickenham

  85/1264
  Demolition, rebuilding and enlargement of dwelling house.
- Min y Don Eel Pie Island Twickenham

  84/0960
  Rehabilitation and extension of existing dwelling house. (Amended plans received 16.11.84.).
- Min y Don Eel Pie Island Twickenham

  84/0960
  Rehabilitation and extension of existing dwelling house. (Amended plans received 16.11.84.).
- Land adjacent to Eel Pie Island Slipways Ltd Eel Pie Island Twickenham

  84/0746
  Erection of a 4 bedroom, 2 storey detached dwelling house with ancillary bedsitting room. (Revised drawing No. 834/10A and 11 dated 19.9.84).
- Blinkwater Eel Pie Island Twickenham Middlesex TW1 3DY

  84/0553
  Alterations and conversion of roofspace to form residential accommodation.
- Land adjacent Rivercourt Eel Pie Island Twickenham

  83/1514
  Erection of a two storey building comprising two flats.
- Ivy Castle Eel Pie Island Twickenham

  82/1303
  Provision of a pitched roof and additional accommodation to existing dwelling.
- Copper Beech Eel Pie Island Twickenham

  82/1213

Erection of two single storey extensions; alterations including new roof and verandah.

- Hluhluwe Eel Pie Island Twickenham

80/1597
Erection of single storey side extension.

- Copper Beech Eel Pie Island Twickenham

80/1119
Erection of three single storey extensions to provide kitchen, living room extensions and two bedrooms.

- Vics Tub Eel Pie Island Twickenham

80/0955
Erection of a single storey dwelling house.

- The Moorings Eel Pie Island Twickenham

80/0595
The erection of a single storey side extension with pitched roof.

- Sycamores Eel Pie Island Twickenham

80/0552
Erection of a single storey extension to provide new bedroom.

- Copper Beech Eel Pie Island Twickenham

79/1277
Erection of one and two storey extensions and construction of new first floor.

- Vics Tub Eel Pie Island Twickenham

79/1040
Erection of a detached single storey dwelling.

- Vics Tub Eel Pie Island Twickenham

78/0948
Erection of a detached single storey dwelling.

- Vics Tub Eel Pie Island Twickenham

77/1264
Demolition of existing building and the erection of a two storey dwelling house.

- Vics Tub Eel Pie Island Twickenham

76/1345
Demolition of existing building and the erection of a detached two storey dwelling house, together with a single storey annexe containing a swimming pool.

- Min-Y-Don Eel Pie Island Twickenham

76/0131
Demolition of existing buildings and erection of a terrace of six houses and one bungalow.

- Min-Y-Don Eel Pie Island Twickenham

76/0131
Demolition of existing buildings and erection of a terrace of six houses and one bungalow.

- River Court Eel Pie Island Twickenham

73/2042
Erection of three-storey extension to existing block of flats comprising three bed-sitting room units.

- Site of Dock and Slipway Eel Pie Island Twickenham

73/1104

Demolition of existing riverside building and erection of four studio houses; provision of improved residents and boatyard facilities; erection of new chandlery store and showroom and erection of a public footbridge to Ham Lands.

- The Haven Eel Pie Island Twickenham

73/1041
Demolition of the existing single-storey dwelling and the erection of a part two-storey, part single-storey dwelling comprising ground floor lounge, kitchen and sauna bath and first floor bedroom and balcony.

- Site of Dock and Slipway Eel Pie Island Twickenham

73/0873
Demolition of existing building and erection of four two-storey terraced houses with boathouses under, provision of terraces and gardens, and extension of existing basin to provide berths for 20 boats.

- Sunrise Eel Pie Island Twickenham

73/0501
Erection of first floor extension to provide self-contained flat.

- Site of Island Hotel Eel Pie Island Twickenham

72/0063
Erection of 18 two-storey houses in three terraces of six houses each and layout of terracing and gardens.

- Sunrise Eel Pie Island Twickenham

71/1268
Erection of first floor addition to provide a self-contained flat.

- Island Hotel Site Eel Pie Island Twickenham

71/0444
Erection of 20 2/3 storey houses in two terraces of 10 houses on former hotel site.

- Plot 7 Eel Pie Island Twickenham

70/1328
Erection of detached bungalow.

- Plot 7 Eel Pie Island Twickenham

70/0090
Erection of two-storey dwelling house.

- Plot 7 Eel Pie Island Twickenham

69/1708
Erection of two-storey dwelling house.

- Desdemona Eel Pie Island Twickenham

67/0283
Erection of a bungalow.

- Twickenham Rowing Club Eel Pie Island Twickenham

66/0413
Erection of two storey extension to provide small boat store with boatman's flat and indoor training room over.

- Desdemona Eel Pie Island Twickenham

65/1570
Erection of bungalow.

- The Nook Eel Pie Island

65/0920

Proposed extension to lounge and addition of new bedroom.

- Palm Beach Eel Pie Island Twickenham

65/0548
Erection of 15 units of residential accommodation.

- land rear of Rowing Club Premises Eel Pie Island Twickenham

65/0579
Erection of a three-storey block of six studio flats.

- The Nook Eel Pie Island Twickenham

65/0468
Extensions to existing dwelling.

- Land In Eel Pie Island (r/o Rowing Club H.Q.) Twickenham

64/0913
Erection of 3 flats.

- The Captains Cabin Eel Pie Island Twickenham

63/0032
Erection of detached brick dwellinghouse.

- The Captains Cabin Eel Pie Island Twickenham

62/1121
Erection of detached brick dwellinghouse.

- The Captain Cabin Eel Pie Island Twickenham

62/1026
Erection of detached brick bungalow.

- Between Twickenham Rowing Club And Eel Pie Island Hotel Eel Pie Island Twickenham

62/0636
Erection of 3 storey building comprising one maisonette and one flat.

- Plots 1, 2, 4 and 5 Eel Pie Island Twickenham

61/0991
Erection of a bungalow.

- adjoining Rowing Club Eel Pie Island Twickenham

61/0823
Erection of a dwelling house.

- Kuala Lumpar Eel Pie Island Twickenham

60/0311
Erection of a dwelling house.

- Plot 6 Eel Pie Island Twickenham

59/0624
Erection of a bungalow.

- Eel Pie Island Twickenham

47/8293
Erection of a bungalow on plot 6/7.

- Plot no. 7 Eel Pie Island Twickenham

47/7049
The erection of a bungalow.

- Eel Pie Island Twickenham

47/6130
The erection of seven bungalows.

- Eel Pie Island Twickenham

47/5813
The erection of seven bungalows.

- Eel Pie Island Twickenham

47/5812
The erection of seven bungalows.

- Eel Pie Island Twickenham

47/5811
The erection of seven bungalows.

- Eel Pie Island Twickenham

47/5810
The erection of seven bungalows.

- Eel Pie Island Twickenham

47/5559
The erection of 7 bungalows.

- On The Site Of Copper Beech Eel Pie Island Twickenham

47/3225
The erection of a detached bungalow.

- Wild Thyme Eel Pie Island Twickenham

47/1622
The addition of verandah, bathroom and porch to existing bungalow.

- Wild Thyme Eel Pie Island Twickenham

47/0698
The addition of verandah, bathroom and porch to existing bungalow.

- Sunrise Eel Pie Island Twickenham

47/0394
The erection of additions to the bungalow.

- Encampment Tea Gardens Eel Pie Island Twickenham

47/0455
The erection of a boat store and bungalow.

Appendix 11: Environmental Agency's considerations for planning applications for floating buildings

Main considerations

Our commentary on planning applications for floating structures should consider how the development could affect flood risk off site, as well as how flood risk could impact the development itself. Considerations include:

- The nature of the flooding in the proposed location and the impact it could have on the development and its users
- What needs to be done to ensure it is safe in the event of flooding in the proposed location in the context of its users
- What needs to be done to ensure the floating structure will be adequately secured in the event of a flood in the proposed location, considering the risk if the proposed development becomes mobile in the event of a flood (for example, if downstream of the location there are bridges, if the structure became mobile it could cause a blockage and increase flood risk elsewhere)

Purpose-built floating structures that cannot be used for navigation (e.g. floating mobile homes or chalets) are often attached to pontoons and therefore more susceptible to being damaged and swept away in a flood. This places their occupants and others at greater risk.

Where floating structures are proposed, it is our preference that they should be passive structures rather than require any active intervention by a third party to enable their floating function (e.g. development rises and falls with the water level without any active intervention to enable this to happen).

Replacement dwellings

For permanent floating buildings (such as those on piles which rise and fall with the water level), for permanent occupation, we should regard such proposals as 'betterment' **if** replacing an existing home. It is up to the LPA to determine if a floating building is permanent or temporary.

This aside, the development proposals should still aim to address the main considerations in the previous section to ensure that the development safe and does not increase risk elsewhere.

Access and Egress

Floating structures will need to offer safe access and egress routes to non-flooded areas should, for example, power or water supplies be lost which

make the house no longer safe or habitable. The flood risk assessment (FRA) with the application should demonstrate that the requirements of the PPG can be met.

The LPA will need to ensure that areas needed for safe access and egress are kept free of development. If a flood warning and evacuation plan is required to achieve safe access and egress, then we should ask the Council to consult with its emergency planners.

Floodplain compensatory storage

In fluvial situations, the FRA will need to show that floodplain compensatory storage will be provided for at least equal displacement of the loaded structure.

We should also be satisfied that the building or structure does not obstruct flows, does not present a risk of breaking free and obstructing flow channels and access, exit, evacuation and rescue are practicable.

Further safety considerations

The main method that floating developments use to minimise the impacts of flooding is by rising above the floodwater therefore preventing the floodwater from entering the building altogether. However, the building is still at risk from flooding which could threaten its integrity and the safety of its occupants.

On both fluvial and tidal floodplains, the floodwater's depth, velocity and the presence of moving debris will influence the overall safety of the design. The PPG contains advice on making developments safe.

During a flood, debris such as large branches or cars, which can be carried by floodwater, may hit the structure above or below the waterline. At high velocities this could damage the structure, including the under-croft area or tanks which may provide the floatation. The potential 'downstream' effects on flood risk of floating buildings and residential moorings should also be taken into account within an FRA.

After a flood, the structure will settle back down upon its foundations. However, if debris has come to rest underneath this will be trapped, potentially resulting in the development not settling evenly. This can cause structural stress and make it very challenging to remove the debris. This would be a particular risk for buildings using stilts or piling as a mechanism to retain a structure in place. The design would also need to ensure its anchorage mechanism can withstand the floodwater velocities.

It is not within our remit to endorse the use of a floating structure for a type of development. This would be a matter for LPA to address.

Maintenance

The responsibility and cost of long term maintenance is likely to rest with the householder, who will need to ensure the building will function properly throughout its design lifetime.

There is a risk that routine maintenance may not be undertaken or key parts of the structure (e.g. the under-croft) cannot be accessed and inspected.

A fault or failure in any part of the design, which compromises the structure's ability to operate properly, may only become apparent during a flood. The LPA should satisfy itself that the structure can be maintained over its lifetime and apply appropriate conditions.

Permitting requirements

Flood Risk Activity Permit

Floating structures in the channel of a Main River or within byelaw distance will require a Flood Risk Activity Permit under the Environmental Permitting (England and Wales) Regulations 2016.

A permit is unlikely to be granted for residential units in the channel of a Main River due to the potential issues they may cause with obstructions to flow and restricted access for maintenance (e.g. vegetation clearance and removal of debris from the channel).

There may also be fisheries, navigation, water quality and aquatic biodiversity issues which we need to consider in responding to consultations.