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ADDITIONAL INFORMATION

**FALCON ROWING
AND CANOEING CLUB
DONNINGTON
OXFORD**

**FLOOD RISK
ASSESSMENT**

Issue B1

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CONTENTS

- 1.0 INTRODUCTION AND BRIEF
- 2.0 EXISTING SITE
- 3.0 EXISTING FLOOD ZONING AND LEVELS
- 4.0 PROPOSED DEVELOPMENT
- 5.0 SPECIFIC ISSUES
 - 5.1 Planning Policies
 - 5.2 The Sequential Test
 - 5.3 Floodplain Storage
 - 5.4 Population at Risk
 - 5.5 Floor Levels
 - 5.6 Flood Flows
 - 5.7 Dry/Safe Access
 - 5.8 Site Drainage
 - 5.9 Residual Risks
- 6.0 CONCLUSION

FIGURES

1. LOCATION PLAN 1:25,000
2. SITE PLAN
3. EXISTING SITE LEVELS
- 4,4a FLOODING HISTORY AND FLOOD ZONING
5. MODELLED FLOOD LEVELS
6. PROPOSAL - ACCESS
7. PROPOSAL – PERSPECTIVES/ELEVATIONS
- 8, PROPOSAL – SITE LAYOUT AND FLOOR PLANS
9. PROPOSED LEVELS/ FLOODPLAIN STORAGE

PHOTOGRAPHS

1.0 INTRODUCTION AND BRIEF

- 1.1 Monson Engineering was commissioned by JPPC to undertake this Flood Risk Assessment (FRA) for proposed development on land adjacent to the Falcon Rowing and Canoeing Club building at Donnington, Oxford. This report is produced in compliance with Planning Policy Statement 25 (PPS 25), 2007, in accordance with the Environment Agency (EA)'s Standing Advice and Guidance Notes, 2007, the Oxford Local Plan, 2005, and the Strategic Flood Assessment for Oxford (OSFRA), 2008.
- 1.2 The proposed development involves the demolition and removal of the existing single-storey wooden boathouse, currently the Falcon club headquarters, and the construction of a two-storey replacement building for the club on land immediately to the north of the existing.

2.0 EXISTING SITE

- 2.1 The location of the site is indicated on Figure 1. It is located on the east bank of the River Thames about two kilometres south of the centre of Oxford.
- 2.2 Figure 2 indicates the site of the existing boathouse with the development site for the building immediately to the north. The site is some 2500 square metres in extent with the existing Falcon Club boathouse occupying 310 square metres of the south of the site. Photo 1 shows the existing building from across the river from the west. Photo 2 is of the front (north side) of the boathouse and photo 3 the land immediately to the north where the new building is proposed. There are open boat storage compound areas on the south and east sides of the existing building. The site generally comprises grass with variable tree screening on three sides.
- 2.3 The River Thames forms the west boundary of the site, a length of some 70 metres, one-third of which comprises a wooden landing stage. The current boathouse is 15 metres from the river bank. Vehicular and pedestrian access is via a track from Donnington Bridge Road to the south. There is a large informal parking area and pedestrian access to the east of the site off Meadow Lane.
- 2.4 Figure 3 illustrates the detail of the existing site, including level information. The site is generally flat, varying in level by only some 700mm, from 55.10 metres AOD adjacent to the river, to 55.80 metres AOD. The floor of the existing boathouse is 55.60 metres AOD, which was 0.87 metres above the river level at the time of the survey. The level of the ground where the new building is proposed is between 55.50metres AOD and 55.80 metres AOD.
- 2.5 The existing boathouse is a single-storey structure with internal breezeblock walls and wood panelled exterior. Two wooden doorways provide access to it on its north side. Its interior (see photo 4) is open boat storage area with a solid floor. The southern end of the building has changing room and toilet facilities.

- 2.6 In terms of the 'floodability' of the existing building, the doorways on the north side, facing upstream, comprise only about 30% of the length of that side (see photo 2). The rest of this side of the building, therefore currently constitutes an obstruction to potential flood water flows. The changing/toilets area at the south end similarly obstruct such flows through the building. Whilst 'floodable', therefore, the building is clearly not designed to allow the free passage of flood water flows through it. As such it is likely to result in a raising of water levels in times of flood, to the detriment of local properties.
- 2.7 The building is served by a foul drain which runs parallel with the east boundary of the site before discharging to Meadow Lane to the east. Roof drainage drains to the ground either via guttering and downpipe or direct from the roof.

3.0 EXISTING FLOOD ZONING AND FLOOD LEVELS

- 3.1 Figure 4 indicates the extent of historic flooding events, Despite its proximity to the river the existing building is only shown to have flooded in 1947. This is borne out by anecdotal information received.
- 3.2 Figure 4a, the Flood Event Outline Map, shows the whole of the site as lying within the 1:100 Flood Zone 3, which extends some 100 metres to the east to Meadow Lane, and for more than 1.5 kms westwards across south Oxford.
- 3.3 This flood zoning classification has now been superseded within the Oxford City area, however, by the Wolvercote (Ox 05b) modelled flood level information, provided as part of the OSFRA report. Data relating to this is indicated on Figure 5.
- 3.4 Section 3.1.1 of the OSFRA describes the 1:200 year flood level as equating to the 1:100 level plus allowance for climate change to the year 2050. Section 4.4.1 of the OSFRA also refers to the redefinition of the flood zone categories in this area. The modelled 1:25 flood level relates to the boundary of Flood Zone 3b, the functional floodplain; the 1:100 flood level is the boundary of Flood Zone 3a, and the 1:200 level the boundary of Flood Zone 2. Such flood zone definitions are derived from PPS 25 and will be considered further in relation to the appropriateness of the development in such flood zones in section 5.0.
- 3.5 Figure 5 illustrates the relevant modelled flood levels derived from the above. Flood Node 47.029 is immediately adjacent to the site and its flood levels may therefore be directly applied to the proposed development. The 1:200 modelled flood level (relating to 1:100 + climate change allowance) is 56.21 metres AOD; the 1:100 (Flood Zone 3a) level is 56.03 metres AOD, and the 1:25 (Flood Zone 3b) level is 55.68 metres AOD.
- 3.6 When related to the site levels described in 2.4 above and shown on Figure 3, it may be seen that the majority of the site lies within the functional floodplain, Flood Zone 3b, and all the site lies within Flood Zone 3a. The floor level of the existing boathouse is 90 mm below the 1:25 flood level (Flood Zone 3b) and 0.44 metres below the 1:100 flood level (Flood Zone 3a).

4.0 PROPOSED DEVELOPMENT

- 4.1 The proposed development comprises the demolition of the existing boathouse building and the construction of a new two-storey building on the land immediately to the north. Figure 6 indicates the location of the new building in relation to the car park and site access off Meadow Lane. Figure 7 shows elevations and perspectives of the new building. An open boat storage compound on the east side of the new clubhouse is proposed to supplement that on the south side.
- 4.2 The footprint of the new building will be some 480 square metres and will consist of boat storage with small store, wc, lift and staircases on the ground floor as indicated on Figure 8. The first floor will comprise a club house, meeting rooms, gym and changing facilities. This floor will be for social and recreational use related to water sports only, and there will be no residential use. There will be a balcony on the first floor level.
- 4.3 Vehicular and pedestrian access to the site will be from the existing informal parking area to the east off Meadow Lane and a more formalised pedestrian/vehicular access to the new building will be provided (see Figure 6). Pedestrian access to the upper floor of the building will be via a lift and staircase in its south-east corner and a staircase on its north side.
- 4.4 The proposed ground floor level for the building will be 55.60 metres AOD, as with the existing building. This reflects an average ground level on the existing site, which ranges from 55.54m to 55.79m AOD on the building footprint. Referring to 3.5 above, this floor level is some 0.43 metres below the 1:100 flood level and 0.61 metres below the 1:100 +20 % (1:200) flood level. All the ground floor of the building, except for the small wc and lift shaft, indicated on Figure 8, will be designed to be 'floodable', as described later in section 5.4.
- 4.5 Any slight raising of ground levels between 55.45 metres AOD and the new floor level of 55.60 metres AOD on the west (river) side of the site will be compensated for on a level-for-level basis and is described in section 5.2. There will be no changes of ground level in the car park area or access route between the car park and the

clubhouse. These areas will be constructed of permeable surfacing throughout and will not result in surface runoff.

- 4.6 The specific consent of the Environment Agency will be required given the proximity of the proposed building to the river.

5.0 SPECIFIC ISSUES

5.1 Planning Policies

- 5.1.1 General and specific planning policies related to this site are contained in the Oxford Local Plan 2001-2016. These include policies NE.8 relating to 'Development on Low-Lying Land'; policy NE.9 requiring Flood Risk Assessments in such areas, and policy NE.10 on sustainable drainage.

- 5.1.2 This specific site is allocated for development on the Proposals Map and under policy DS.25 of the Local Plan. This policy states that:

'Planning permission will be granted at Donnington Bridge Road for new riversport facilities...This site is low-lying so development proposals must be subject to appropriate flood protection and sustainable drainage measures, and not have an adverse impact on flooding elsewhere'.

- 5.1.3 Section 14.2.38 of the Local Plan states that:

' riversports facilities at this site...could be enhanced by replacing the present buildings with an accessible modern sports centre. The site is in the...flood plain so the area occupied by any new buildings should not be increased. An appropriate standard of flood defence must also be put in place, and any proposal should be designed not to be impede flood flows or result in a net loss of flood water storage'.

- 5.1.4 Oxford City Council has therefore officially identified and designated this site for redevelopment for the river sports use proposed.

5.2 The Sequential Test

- 5.2.1 The requirements of the Sequential Test are set out in Appendix D of PPS25 and section 4.0 of the Strategic Flood Risk Assessment for Oxford.
- 5.2.2 Tables D2 and D3 in Appendix D of PPS25 classify a water-based recreational use (excluding any associated residential use), as proposed here, as 'water compatible'. Table D1 shows that such a use is one of the few deemed appropriate in Flood Zones 3a and 3b. This site is located in both of these zones, as described in section 3.6 above and shown on Figure 4.
- 5.2.3 It should be noted that the first floor use proposed for this building here has been formally accepted by Oxford City Council planning department as wholly ancillary to the water-based recreation use. The use of the whole building is therefore 'water compatible' and is appropriate under PPS25 in the location proposed.
- 5.2.4 Specific requirements for such development within Flood Zones 3a and 3b are set out in Table D1 of PPS25. These include the relocating of existing development in such zones to areas with a lesser likelihood of flooding – a key element in the application of the Sequential Test.
- 5.2.5 In the case of this development, however, the viability of the boating and rowing function demands that it be sited immediately adjacent to the river. Such a location obviously affords ease of access to the river. The specific siting here is further demanded by the current boat/clubhouse on the site and is also reflected in the formal allocation of this site in the Oxford Local Plan.
- 5.2.6 Given the above pre-requisites, therefore, the application of the Sequential Test, in terms of seeking to locate such a development proposal in an area less likely to flood (ie further from the river), is not deemed to be appropriate in this case.

5.3 Floodplain Storage

5.3.1 Figure 9 indicates the new building related to the existing; the existing site contours at 0.1 metre intervals, and the proposed levels on the site.

5.3.2 The existing boathouse building will be totally removed and the floor slab removed to enable recontouring of this area of the site to a level of 55.40 metres AOD, as indicated on Figure 9. This will result in the provision of additional flood storage to this level below the existing boathouse's prevailing floor level of 55.60 metres AOD, and to the adjacent land. In 0.1 metre bands, this amounts to:

Existing boathouse footprint:

$$55.40\text{m}-55.50\text{m}: 270\text{m}^2 \times 0.1\text{m} = 27.0\text{m}^3$$

$$55.50\text{m}-55.60\text{m}: (125\text{m}^2 \times 0.1\text{m}) + (170\text{m}^2 \times 0.05\text{m}) = 21.0\text{m}^3$$

This results in a total additional flood plain volume provision of some 48 cubic metres.

Land on west (river) and east sides (respectively) of the existing boathouse, lowered to 55.40m AOD:

$$55.40\text{m}-55.50\text{m}: (176\text{m}^2 \times 0.1\text{m}) + (68\text{m}^2 \times 0.05\text{m}) = 21.0\text{m}^3$$

$$55.50\text{m}-55.60\text{m}: (95\text{m}^2 \times 0.1\text{m}) + (60\text{m}^2 \times 0.05\text{m}) = 12.5\text{m}^3$$

$$55.60\text{m}-55.70\text{m}: 74\text{m}^2 \times 0.05\text{m} = 3.7\text{m}^3$$

This results in a total additional flood plain volume provision of some 37.2 cubic metres.

The total additional flood storage volume provided by the removal of the existing boathouse and the lowering of the surrounding land, both to a prevailing level of 55.40 metres AOD, therefore amounts to 85.2 cubic metres.

5.3.3 As described in section 2.6, although the existing boathouse building will allow floodwater to enter, it has not been designed to be efficiently floodable. Its construction is such that it constitutes an obstruction to flood storage and also to flood flows. This is particularly true of the changing/toilets area at its south end. In terms of flood storage above its floor level which might be gained due to its removal, a conservative estimate is deemed to be 20% of its area of 310 square metres, ie 62 square metres. The following flood storage area gain due to demolition of the building, up to the 1:100 year flood level (56.03m AOD), will therefore be:

55.60m to 55.70m AOD	- 62 x 0.1m	= 6.2m ³
55.70m to 55.80m AOD	- 62 x 0.1m	= 6.2m ³
55.80m to 55.90m AOD	- 62 x 0.1m	= 6.2m ³
55.90m to 56.00m AOD	- 62 x 0.1m	= 6.2m ³
56.00m to 56.03m AOD	- 62 x 0.03m	= 1.8m ³

This amounts to a total of 32.8 cubic metres of additional flood storage above the existing floor level, which will be created by the removal of the existing boathouse.

5.3.4 The new building, the outline of which is shown on Figure 9, will occupy a footprint of some 480 square metres with a floor level of 55.60 metres AOD. The ground floor boat storage area is designed to be completely floodable, apart from the entrance/lift shaft and wc on the south-east side. These have a combined footprint of 8 square metres.

5.3.5 The area of flood plain occupied as a result of the construction of the new building, which is all to be constructed on ground above 55.50 metres AOD, below the proposed ground floor level of 55.60 metres AOD, including floor slab, amounts to:

$$55.50\text{m to }55.60\text{m AOD} - 66\text{m}^2 \times 0.05\text{m} = 3.3\text{m}^3$$

5.3.6 The majority of the new building is to be constructed on ground with a current level between 55.60 metres AOD and 55.79 metres AOD. The effect of this will be to create additional flood storage area within the ground floor boat storage area to accommodate extreme floods between these levels. The additional flood volume provided within the building, will amount to:

55.60m to 55.70m AOD - $270\text{m}^2 \times 0.05\text{m} = 13.5\text{m}^3$

55.70m to 55.80m AOD - $120\text{m}^2 \times 0.05\text{m} = 6.0\text{m}^3$

5.3.7 The external walls and internal support structure of the new building will occupy a small part of the floodplain, between 55.60 metres AOD and the 1:100 year flood level of 56.03 metres AOD. 70 metres length of external wall, a maximum of 20 internal support piers, plus the areas mentioned in 5.3.4 above, results in a lost floodplain area of some 50 square metres.

This results in the loss of 5 cubic metres of flood plain volume for each 0.1 metre flood band between 55.60m AOD and 56.00m AOD, and 1.5 cubic metres between 56.00m AOD and 56.03m AOD.

5.3.8 Summarising the effect of the development on the flood plain storage volume based on the volume gains from 5.3.2, 5.3.3 and 5.3.6 above, and the losses described in 5.3.5 and 5.3.7. The result is a **considerable** NETT GAIN for each 0.1 metre band, viz.,

55.40m to 55.50m AOD - 48.0m³

55.50m to 55.60m AOD - 30.2m³

55.60m to 55.70m AOD - 18.4m³

55.70m to 55.80m AOD - 7.2m³

55.80m to 55.90m AOD - 1.2m³

55.90m to 56.00m AOD - 1.2m³

56.00m to 56.03m AOD - 0.3m³

5.4 Floor Levels

5.4.1 The level of the ground floor of the new boathouse will be 55.60 metres AOD. This is 0.43 metres below the modelled 1:100 year flood level and 0.61 metres below the 1:100 + 20% flood level for the locality. The use of the ground floor will, however, be strictly limited to the racked storage of boats, a 'water-compatible' use, and will therefore be designed to be 'floodable'.

5.4.2 The upper floor of the building, which will be used for social, changing and other ancillary uses, is accessed by stairs and lift from the south-east side, and by stairs on the north side. There will be no resident population on the site.

5.4.3 Any flooding event affecting the site will therefore impact on the boathouse and access to the ground and upper floors. Given the non-residential use proposed, access for the recreational use of the building will be optional and will not be allowed in times of extreme flood. This will be formally stated in a Flood Warning and Monitoring Plan for the site. No additional flood risk to users of the building will therefore result due to the floor level proposed.

5.5 Flood Flows

5.5.1 The design of the ground floor of the building will be such as to allow the free passage of floodwater and flood flows from the river into, and through, the ground floor boathouse. The building has been designed with no internal walling on the ground floor and with wide boathouse doorways on its north and south sides, to facilitate flood flows (see Figure 8). The doorways actually make up 75% of these sides of the ground floor, in line with the river flow direction. The rest of the ground floor exterior will be of brick construction, waterproofed up to the flood level.

5.5.2 The boathouse doorways and the walls will be constructed to allow the free passage of flood water between the floor level of 55.60 metres AOD and the 1:100 year + climate change level of 56.21 metres AOD, a height of 0.61 metres. The walls' brickwork will comprise 50% voids to facilitate this, up to this flood level. The main doorways will be constructed with adjustable shuttering up to 56.21 metres AOD, to facilitate the passage of flows through the building.

5.5.3 The only exceptions to the above will be those small areas of the building mentioned in 5.3.7 above which will not allow direct passage of flood flows. These will consist of the ground floor wc, lift shaft and the building support piers. The total ground area of these will amount to some 50 square metres, compared to the total building footprint of 480 square metres.

5.5.4 Within the boathouse, boat storage will be in the form of raised racking designed not to impede flood flows through the building.

5.5.5 The building is therefore specifically designed, both in its layout and construction, to allow for the passage of flood flows from the Thames. This may be favourably compared with the obstruction to flood flows currently posed by the existing boathouse, as described in 2.6 above.

5.6 Dry/Safe Access

5.6.1 The proposal does not involve any resident population, and the use of the site will be solely for the water-based recreational use and ancillary social use. There will therefore be no requirement for compulsory access to/from the site for evacuation purposes in times of extreme flood. Use of the building and its facilities in flood conditions will be allowed only when the site is deemed safe to access and use. The preconditions for this will be detailed in the Flood Warning and Monitoring Plan for the site.

5.6.2 Although Table D1 of PPS 25 requires water-compatible development to be safe and operable in times of flood, there is inevitably a balance to be struck between the use of such facilities and the safety of those using them, as with the existing club/boathouse. Strict conditions for the use of the facilities for a range of flood conditions will therefore be set out in the Flood Warning and Monitoring Plan.

5.6.3 Flood depths on the site will be 0.43 metres in the event of a 1:100 year flood event, and 0.61 metres for the 1:100 +20% level. Access routes to the site will be similarly affected. These are the same flood conditions which apply to the existing boathouse/clubhouse building on the site. As at present, access to, and use of, the new building will be optional and will be determined by the club management in compliance with the Flood Plan.

5.6.4 Given the above there will be no additional flood risk on the site in terms of access/egress to or from the building.

5.7 Population at Risk

- 5.7.1 There will be no resident population at risk on the site due to the development proposal. This is the same situation as prevails with the existing boathouse building.
- 5.7.2 As a result there will be no requirement for any resident evacuation plan involving liaison with relevant emergency services.
- 5.7.3 Although the numbers using the facilities in the new building will be more than the existing boathouse, these will be temporary users or visitors. Their presence on the site will be controlled by the club management and access will not be allowed to the building if there deemed to be any existing, or anticipated, flood risk.
- 5.7.4 With regard to the anticipation of flooding, it should be noted that section 2.6.1 of the OSFRA states that there is a 20-hour delay between peak rainfall higher in the Thames catchment and peak river levels in the city. Such a period will enable any necessary restrictions on the use of the site to be acted upon in due time, together with the everyday monitoring of the river levels.

5.8 Site Drainage

- 5.8.1 The use of Sustainable Drainage System (Suds) principles in accordance with Annex F of PPS 25, section 6.4 of the OSFRA, and the Building Regulations Part H3, will be adopted in the surface water drainage of the building and its surrounds. In accordance with such principles there will be no direct runoff from the roof area to the river or the ditch on the north side of the site.
- 5.8.2 Surface water runoff from the roof will discharge to a shallow swale/ infiltration system on the site. An overflow pipe will be provided at the end of this to the ditch abovementioned, with a non-return valve. Given that the water table will be high on the site this soakage system will be constructed as shallow as possible.
- 5.8.3 Improvements to the access route and the adjacent parking area will be undertaken with robust permeable materials in order to allow direct soakage into the ground, in compliance with Suds principles.

5.9 Residual Risks

- 5.9.1 In accordance with Annex G of PPS 25 consideration under this head will be given to flood resilient construction, and the Flood Warning and Monitoring Plan which will be produced for the site.
- 5.9.2 The building will be located in an area with a high water table and will be occasionally subject to flooding on its ground floor. The floor and its foundations will therefore be designed with materials to counteract the effects of such. The walls on the ground floor, where applicable will also comprise flood resilient materials and construction.
- 5.9.3 Within the building, on the ground floor, any electrical controls, cables or associated appliances will all be located at a level above the 1:100 + 20% flood level.
- 5.9.4 Although Table D1 of PPS 25 refers to water-compatible uses in such Flood Zone areas remaining usable and safe in times of flood, there will be times of extreme flood when it will not be safe to do. At such times the health and safety of the potential site users will always take precedence over what is always an optional, and not compulsory, use of the recreational facilities.
- 5.9.5 The conditions of use of the boathouse and associated facilities at times of flood or anticipated flood will be strictly monitored and controlled by the club in accordance with a Flood Warning and Monitoring Plan. This will contain strict guidance for users of the site, enforceable by the club, relating to flood conditions and the relative flood risk posed. Where the site is deemed unsafe, relating to the depth of water, velocity of flow and presence of debris, the premises will be closed to users. The club will regularly monitor flood conditions and always act in order to minimise flood risk to all users of the site. Designated staff will be named by the club to undertake such tasks.
- 5.9.6 The Environment Agency's flood warning service, allied to the minimum 20-hour notice period of an approaching flood (OSFRA, s.2.6.1) for this stretch of the Thames, will ensure that due notice of flood risk may be given, as well as affording time for the postponement of any planned events on the site.

6.0 CONCLUSION

- 6.1 This report is deemed to fulfil the requirements of the City Council planning policies outlined in s.5.1.1 above, and those of PPS 25.
- 6.2 It has been demonstrated that the proposed development will serve to increase the flood storage volume on the site, to the benefit of the surrounding area (s.5.3 above). There will also be less obstruction to river flows than at present following the demolition of the existing building and recontouring of the site. (s.5.5).
- 6.3 There is to be no residential use requiring associated evacuation procedures and it will be ensured through the strict enforcement of the Flood Plan governing the use of the site that no flood risk results to its users.
- 6.4 Suds techniques will be employed to drain the development and flood resilient construction methods adopted up to the maximum flood level.
- 6.5 Overall, therefore, the proposal will serve to improve the flood risk in the area, to the benefit of the future users of the site and those in the surrounding area.

FIGURE 1

LOCATION PLAN

