Appendix 7.1.3

Note: Turbine and sluice gate arrangement
Tidal Lagoon Swansea Bay plc

TLSB 9-3 Clarification Note Chapter 9

**Topic:** Assessment of turbine and sluice gate arrangement as modelled in Environmental Statement (ES) in relation to fish strikes is worst case for fish

**1.0 Introduction**

1.0.1 This clarification note explains the approach to modelling turbine and sluice gate arrangements for fish-encounter and behaviour effects. It explains that the modelled arrangement, whilst unlikely to be that selected for the Project, represents a reasonable, worst case scenario. Hence, the likely engineering solution now proposed represents an acceptable design within the parameters subject to EIA.

1.0.2 This note compares the turbine/sluice gate arrangement modelled in relation to:

i. the reduction in the number of sluice gates from 10 to 8; and

ii. the disposition of turbines (T) and sluices (S) being altered from 16T - 8S to 8T - 10S - 8T, as shown diagrammatically on Figure 4.12.

**2.0 Clarification**

2.0.1 Modelling of the potential effects on fish was based on an 8T - 10S - 8T layout (Appendix 9.4 – Appendix 1 Drawings annexed hereto). Since instigation of the fish encounter modelling, further design work was undertaken on the layout and the selected design is as presented in Chapter 4, Figure 4.12 (namely 16T - 8S). This design improves flows, reduces turbulence and provides a maintenance area on top of the turbine housing structure. As stated in Chapter 4 of the ES (4.3.3.5), the exact configuration of the sluice gates and turbines in the housing structure is yet to be finalised and the final design will be arranged to minimise scour as the water enters and leaves the lagoon. However, the most likely design is the 16T - 8S configuration.

2.0.2 The 8T - 10S - 8T arrangement was modelled as worst case for the purpose of the fish assessment. This earlier arrangement included the maximum number of turbines (16) and sluice gates (10). The number of sluice gates now being promoted has reduced to 8. However this does not fundamentally change the assessment as the 8 sluice gates are larger than the 10 previously considered, and allow the same volume of flow through the sluice gates. The number of turbines is constant.

2.0.3 In terms of the fish encounter assessment, this reduction in sluice gates is of importance to herring. In Chapter 9 of the ES, it is predicted that due to the exceptional sensitivity of herring to shear stress, if any passed within 10 cm of the edges of the sluices, they could be damaged by shear stress (e.g. causing scale loss). Reducing the number of sluices from ten to eight will reduce the ratio of edge to open area, thus the damage caused by this effect would be slightly reduced. For this reason it is considered that 10 sluice gates are a “worst case”. In practice, the benefit is likely to be negligible and as such the change has been, conservatively, regarded as neutral. However, it is certainly within the assessed parameters.

2.0.4 With regard to the variation in the arrangement of the turbine and sluice gates, the IBM and STRIKER encounter modelling do not distinguish between the turbine/sluice gate arrangement since the model is predicated upon the relative volumes of water passing via each route (all the turbines combined versus all the sluices combined). A small difference in the flow of water over each sluice may accrue from the use of eight larger sluices compared to ten smaller sluices, but there will be an equivalent overall flow. As explained in Note TLSP 9-2, in terms of the model, once fish are within the draw zone of the turbines they are committed to passing through the turbines and the particular arrangement of the turbines within the housing structure is not material to the outcome.

2.0.5 The 16T - 8S arrangement would also make potential mitigation with acoustic deterrents simpler and more effective as the deterrents can focus on the area of turbines (with sluice gates allowing free passage to fish). Therefore the assessed configuration with sluice gates located between the two turbines represents a less favourable case in this respect.