Flood Risk Assessment.

Proposed Natural Rock Fish Pass. Burton Bridge Weir, River Trent. Off Bridge St, Burton Upon Trent, Staffordshire.

Fishtek Consulting Ltd.

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1 FRA 3.

Reference:
Development in flood zone 3b is defined as land where water has to flow or be stored in times of flood, based on Environment Agency Guidance relating to Planning Policy Statement 25 (PPS25), Annex D.

All developments in flood zone 3b areas should be accompanied by a FRA as per Annex E PPS 25.

Purpose of Flood Risk Assessment:
To assess the suitability of the proposed rock pass development for planning purposes.

Specific advice from the EA stipulates that a fish pass development is ‘water compatible’ (nature conservation & biodiversity), as per table D2 PPS 25. The development is NOT classified as essential infrastructure.

PPS 25 table D3 classes water compatible developments as allowable in flood zone 3 areas.

Preliminary or Full Flood Risk Assessment:
Full to support planning application.

1.1 Plans.

1.1.1 Location Plan.

See Location Plan. in appendix showing the Site features.

The proposed development is located at Burton Bridge Weir on the River Trent, Burton Upon Trent, and is accessed via an access ramp towards the W side of Burton Bridge/Bridge Street (A511).

Locally, the River Trent flows from south-north and diverges approximately 300m south of Burton Bridge. The two branches of the river converge just north of Burton Bridge before diverging again in to two branches before meeting approximately 2.2km downstream.

The weir is situated on the western branch of the river and runs under Burton Bridge, located from the south end of the island north of Burton Bridge to the west bank of the Trent.
The island to the east as well as the river bank to the west of the Site comprise the principal flood plain to the local area other islands to the north and south. The low lying island and flood plains are generally devoid of infrastructure/building, and are instead used for recreation, parkland, wetlands as well as agricultural uses.

The surrounding area to the east and west of the flood plains has a mix of residential and commercial development.

1.1.2 Site plan.

Refer to Site Plan and proposed development in appendix.

The existing weir is understood to have been constructed to control the flow and water levels in the river for the mills that existed downstream. There is a stone sluice to the south west end of the weir which is thought to be an original feature, and was used to reduce water levels in order for weir maintenance. The weir and sluice are of masonry construction. There is a silt bank which has developed on the south-west part of the weir adjacent to the river bank wall.

Currently, the ownership of the weir is unknown. The west bank of the River Trent is understood to be owned by East Staffordshire Borough Council.

Locally the west bank comprises a masonry retaining wall and natural banks to the east side of the river. Approximately 50m west of the proposed fish pass is a flood defence wall to the Meadowside Leisure Centre and car park. Burton Bridge is a masonry multi-arch bridge which spans across the floodingplain.

The proposed fish pass is being developed to promote fish access to the upper reaches of the Trent. It is to be located in the existing weir between the west bank of the river and the stone sluice structure.

The fish pass will be a natural rock pass with nominally 600mm dia x 900mm perturbation boulders set in armour stone bedding. The rock pass will have a nominal 1:20 gradient, be approx 14 x 5m, and will replace the existing weir in this location. To the west side of the fish pass will be block stone scour protection backfilled to the existing bank with armour stone.

1.2 Derivation of Data, Surveys and Models.

1.2.1 Existing and proposed topography.

A topographic survey of the Site was undertaken by AP Land Surveys. The survey data extended to the flood wall to Meadowside Leisure Centre, to the east bank of the river, and encompassed the weir structure.

The existing topography indicates that the west bank of river is nominally 44.20m aOD in the vicinity of the weir crest which rises to 45.13m aOD at the Meadowside Leisure Centre. The entrance gate to Meadowside Leisure Centre car park is at 45.65m aOD which is above the Q100 flood level.

The existing weir cill is 43.65m aOD, with the top of the sluice at nominally 44.30m aOD at the weir crest. The upstream bed level is approximately 43.30m aOD, and the downstream level nominally 42.60m aOD.
The proposed fish pass has an upstream bed level of 43.40m aOD, with perturbation boulders protruding 600mm above this. The downstream bed level is proposed to be 42.77m aOD.

1.2.2 Derivation of Stage and Return Period Data.

Flood data for the vicinity of the weir (both up & downstream) was obtained from the Environment Agency in August 2012.

The modelled flood data and maps (refer to appendix) included Q5, Q10, Q25, Q50, Q75, & Q100, in the upper and lower reaches of the weir.

The data was further analysed by TJ Booth Associates and the Q1, Q2 return flood period levels for the upper and lower reaches of the weir estimated. The data is tabulated below.

<table>
<thead>
<tr>
<th>Return Period Event</th>
<th>TJBA Analysis</th>
<th>Data from EA/EA Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
</tr>
<tr>
<td>U/S of Weir (m aOD)</td>
<td>44.45</td>
<td>44.65</td>
</tr>
<tr>
<td>D/S of Weir (m aOD)</td>
<td>44.37</td>
<td>44.55</td>
</tr>
</tbody>
</table>

The western bank is nominally 44.20m aOD and the eastern bank opposite the weir nominally 42.25m aOD. The above data indicates that in the case of both the upper and lower reaches of the weir, overland flow begins to occur in as little as a Q1 flood level event.

1.3 Assessments.

1.3.1 Existing surface water system.

The Trent is generally bifurcated through the town centre of Burton, and the western branch of the river is where the weir and proposed works are located.

Locally, water flows over the weir and the west and east branches of the river system are converge over 2km downstream.

The weir and sluice at Burton Bridge, as well as the bridge support piers/arches are all features which influence the hydraulics of the river.

The current state of the weir appears to be in generally good condition. However, the sluice towards the south-west side is in a state of disrepair and is overgrown with shrubs/vegetation.

1.3.2 Proposed surface water system.

The proposed fish pass will not generate additional run off to the surface water systems. The fish pass will replace part of the existing weir removing water from the upper reach of the weir and returning it to the lower reach.

1.3.3 Climate change impacts.

Climate change impacts are given in PPS 25 table B2.

However for the remit of this report, change in flows due to climate do not impact upon the proposed development. The proposed development is flooded in as little
as a Q1/Q2 return period flood event and a flood event will have no impact upon the scheme (i.e. the development is expected to be totally inundated above Q10 with no adverse risk).

1.3.4 Fluvial morphological impacts.

The proposed works are to the existing fluvial system and essentially replace part of the existing weir structure. Overall there is a net addition to flood storage and flow path in the functional flood plain.

As part of the proposed works, the existing weir in the location of the fish pass will be excavated and reduced. The proposed fish pass bed level will be set lower than the existing weir. Also, an existing silt bank adjacent the bank wall will be excavated as part of the works to the original bed level. As a conservative estimate due to these works, a net gain of at least 17.5m$^3$ of flood storage volume would be attained (approx 15.5m$^3$ from the excavated weir and 2m$^3$ from the silt bank if lowered to current weir crest level).

Conversely, the blockwork side protection & backfill to the existing bank, as well as the perturbation boulders above the existing weir level would slightly reduce flood volume. Again as a conservative estimate, a loss of approximately 15.25m$^3$ is attributed to the above (11.75m$^3$ from the side protection and backfill, and 3.5m$^3$ from the perturbation boulders).

Overall, flood storage capacity as a result of the development would increase by approx 2m$^3$ lowering the flood risk by a very small amount.

The proposed works will also create additional overland flow as a result of excavating and reducing the weir. It is estimated that the area gained as a result of the proposed works at the intake to the fish pass is approximately 0.85m$^2$.

1.3.5 Potential sources of flooding.

Refer to Environment Agency Flood Zone Maps. in the Appendix.

The Flood Zone Map indicates the site has a significant chance of flooding (EA criteria) and is within Zone 3a (PPS25 criteria).

a. Fluvial flooding from main river.

As the Site is in the main river it is considered to be in a flood zone 3b area.

The proposed works will be inundated by a Q10 return period flood but consequently suffer no adverse risk.

b. Fluvial flooding from minor watercourses / drainage channels.

There are no minor watercourses in the local vicinity of the Site that would otherwise pose more of a threat/risk than the main river.

c. Overland flow.

Although the proposed fish pass is within the river banks, any Site plant/machinery or office cabins would be stored out of the river and therefore risk flooding by overland flow. In addition to this whilst construction is taking
place, any plant or office cabins would also increase the risk of flooding elsewhere by a small margin by taking up flood storage volume on the flood plain.

d. Springs and high groundwater levels.

Groundwater levels are considered to be controlled by the level of the river and thus will not be an issue to the proposed works.

e. Surcharging of local drainage & sewerage systems.

The proposed works would not be affected by local drainage or sewerage system flooding.

1.4 Conclusion & Residual risks.

The conclusion of this report is that the proposed fish pass will not negatively affect flood risk in the local area or elsewhere. The proposed development will increase flood storage, and create an additional flow route reducing the overall flood risk in the local area.

However, during construction temporary fences, site cabins and plant machinery will add to the flood risk if stored within the active flood plain.

Due to the above, suitable situation of the Site cabins should be agreed with the LPA. A possible location for the siting of cabins could be the grassed area to the north east of the Burton Bridge access ramp (adjacent Meadowside Leisure Centre car park) which is behind the Q100 flood wall. Alternatively cabins could be placed on stilts/columns raising the cabins above the flood Q100 Flood level.

It is recommended that plant machinery could be stored in the flood plain/adjacent the river, subject to a satisfactory warning system alerting Site managers/personnel to predicted flood events. Plant/machinery could then be moved to safe levels in the event of a flood warning.

It is advised by the EA that the use of Heras fencing for temporary works is to be carefully managed and that the construction operations are included in the flood risk warning system. Appropriate action can be taken by the contractors to prevent partial blockage of overland flood paths by temporary removal of fencing in the occasion of a flood warning.
2 Appendices.

2.1 Location Plan.

2.2 Site Plan.
2.3 Proposed Fish Pass Plan.

2.4 Environment Agency Flood Zone Maps.
### 2.5 Site Photographs.
2.6 References.

i. Planning Policy Statement 25, Dec 06.
iii. Topographical Survey, AP Land & Engineering Surveyors, Feb 12.
iv. Flood Zone Maps, EA, Sept 12.