

10.0 SURFACE WATERS AND FLOOD RISK

10.1 Introduction

10.1.1 This chapter of the Environmental Statement considers the proposed development in the context of flooding risk and addresses the need for a formal Flood Risk Assessment (FRA) in accordance with the requirements of Planning Policy Statement 25 (PPS 25) – Development and Flood Risk. An appraisal is also presented of on-site activities (during both the construction phase and the operational phase) and the potential effects these may have upon the local water environment. Specifically, it concentrates upon the following potential impacts:

- flood risk issues;
- disturbance of surface water drainage regimes;
- contamination of surface waters by suspended solids or by other pollutants.

10.1.2 The context of the existing hydrological regime is established and the potential impacts relating to the scheme proposals are appraised.

10.2 Baseline Context

10.2.1 This assessment has primarily involved a desk-study based upon information gleaned from the following sources:

- Environment Agency On-line Flood Zone Mapping;
- North Lincolnshire – Interactive On-line SFRA Mapping;
- Consultations with the Environment Agency Flood Risk team;
- Consultations with representatives from the Ancholme Internal Drainage Board.

10.2.2 Reference to the Environment Agency's (EA) floodplain maps has confirmed that the site lies within an area at risk from tidal or fluvial flooding, with a statistical return period more frequent than 1 in 100 years (i.e. >1% probability). Accordingly, it can be categorised as a Zone 3a (High Probability) Flood Risk Area.

- 10.2.3 The EA provides standing advice relating to the preparation of flood risk assessments for 'Development in Flood Zones 3 and 2 (Excluding Minor Extensions)'. This guidance provides details of the extent of information and assessment that should be submitted as part of the flood risk assessment submitted in support of a planning application for development.
- 10.2.4 Discussions with representatives from North Lincolnshire Council have confirmed that the proposal site also lies within an area that has been the subject of a Strategic Flood Risk Assessment. In this respect, the site is classified as Flood Risk Zone 2, conflicting with the designation recorded on the Environment Agency's flood mapping system. However, it is understood that this difference is attributable to the Agency's interpretation of the protection afforded by 'soft defences' which is, effectively, to ignore their existence.
- 10.2.5 The proposal site also lies within the administrative boundaries of the Ancholme Internal Drainage Board (IDB). As such, statutory functions relating to 'ordinary watercourses' within this area (land drainage consenting procedures etc.) are the responsibility of the IDB, as opposed to the EA. The Ancholme IDB will also be a key consultee throughout the planning process on flood risk matters.

10.3 Flood Risk

- 10.3.1 As stated above, the development site lies within Flood Zone 3a of the Environment Agency's flood mapping system. A Flood Risk Assessment (FRA) has been prepared and is submitted in support of the planning application for the proposed REP; specifically *Brigg Renewable Energy Plant Flood Risk Assessment* (JBA Consulting January 2009) presented at Appendix 10-1.
- 10.3.2 The FRA has been developed in consultation with representatives from both the Environment Agency and the Ancholme IDB and considers the implications of raising the development site to 4.0m AOD, which is above those levels that would be inundated during a statistical 1 in 100 year flood event.

- 10.3.3 The FRA also includes conceptual details of an on-site flood mitigation and surface water attenuation scheme designed to ameliorate the impacts of the proposed development upon the local hydrological environment. This comprises a series of areas to be excavated (shown on Drawing No: 2008s3591-004 contained in Appendix 10-1).
- 10.3.4 Parts of the renewable energy plant that would be located within the existing flood-plain could be damaged during a flood event and, consequently, they should be raised out of the flood-plain to ensure safe and reliable operation of the plant. Where land within the existing flood-plain is raised, it is essential that the development provides sufficient compensatory storage for the flood waters that would otherwise have occupied that area of the flood-plain. Consequently, ground levels are to be lowered on land currently outside the flood-plain for flood mitigation. In addition, as the route of water from Scawby Beck would be impeded by the development, a diversionary route has been designed with culverts under proposed roads linking areas of compensatory flood storage.
- 10.3.5 Another guiding principle of the FRA is that surface water drainage should be managed such that runoff from the site in its developed form is equivalent to that of a 'greenfield' site. It is proposed that surface water drainage attenuation would be achieved by providing a lagoon with a storage volume of 1,503m³ (equating to the requirement for the 1 in 100 year storm event plus climate change). The lagoon has a base level of 1.2m AOD, a maximum top water level of 2.1m AOD and a plan area of approximately 2,261m².
- 10.3.6 The conceptual flood relief scheme set out in Appendix 10-1 has been subject to further development and rationalisation and the compensatory storage basins and attenuation lagoon, in their proposed forms, are illustrated on Drawing No: 15674/A1/0101 Rev F contained within the Planning Application Document which accompanies the application. The proposed scheme adheres to the principles set out in the FRA mitigation scheme (in Appendix 10-1) and provides equivalent flood compensation storage volumes; albeit the excavations have been slightly modified in terms of their location and extent and the proposals also include raising the two straw barn facilities, such that the ground beneath the structures would operate as flood storage in the more extreme events. The areas and volumes of excavation provided in the

proposed scheme are set out in Table 10.1 below. This table is the equivalent of Table 7-1 in the FRA which provides the areas and volumes for the conceptual solution.

Table 10.1: Volumes provided in flood-plain compensation

Contour mAOD	Flood-plain volume lost between 200mm deep contours (m ³)	Flood-plain volume re-provided between 200mm deep contours (m ³)	Difference (m ³)
2.2 – 2.4	380	1,902	1,522
2.4 – 2.6	737	1,987	1,250
2.6 – 2.8	859	2,072	1,213
2.8 – 3.0	1,097	2,157	1,060
3.0 – 3.2	2,095	2,263	168
3.2 – 3.4	3,249	3,794	545
3.4 – 3.6	3,691	3,724	33

10.3.7 The table illustrates (as per the conceptual scheme in Appendix 10-1) that the volume of compensation provided between each contour band is, in all case, greater than that lost due to the development. The development would provide in excess of 5,700m³ of additional flood water storage within the development boundary, over and above the current provision within the flood-plain. The additional storage capacity would help to reduce the wider impacts of future flooding events in the locality, which are known to have caused historical problems in the vicinity of the development site.

10.3.8 The proposed flood mitigation scheme (Drawing 15674/A1/0101 Rev F) is an integral part of the resubmission proposals and would ensure that the REP would not cause detrimental effects in terms of flood risk. It is suggested that the final detailed design of this scheme be controlled by a suitably-worded planning condition.

Sequential Test

10.3.9 Planning Policy Statement 25 (PPS25) 'Development and Flood Risk' requires that, where development is proposed within Flood Zones 2 & 3, the application site shall be the subject of a Sequential Test, to demonstrate that no more suitable alternative sites exist within a less vulnerable Flood Zone.

10.3.10 Appendix 10-2 includes details of the Sequential Test undertaken in support of the Brigg REP proposals. The assessment concludes that there are no suitable, developable and deliverable alternative sites, better located from a flood risk perspective, which could accommodate the proposed development, as required to satisfy PPS25.

Exception Test

10.3.11 PPS25 also requires that development categorized as 'Essential Infrastructure' (which includes electricity generating power stations) must also be subjected to the Exception Test, where the proposal site lies within Flood Zone 3.

10.3.12 The Exception Test, essentially, poses three questions; each of which is set out below, together with a brief explanation as to how the proposed REP development satisfies the requirements of the individual tests:

PPS25 Section D9:

For the Exception Test to be passed:

a) it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk...

- The Energy White Paper includes targets which aim to see renewables grow as a proportion of electricity supply to 10% in 2010, rising to 20% in 2020. The provision of electricity supply by renewables in 2006 was 4%. Consequently, a significant number of new facilities will need to come forward if the targets are to be achieved;
- The UK Biomass Strategy promotes the use of biomass as an energy source and notes that biomass will have a central role to play in meeting the Government's aspiration of 20% renewable energy by 2020. It also acknowledges the importance of energy generated from biomass in tackling climate change;
- There is a significant renewable energy capacity shortfall on a regional basis. The emerging RSS states that in 2007 installed renewable energy capacity totalled approximately 168MW. Therefore, there is a substantial requirement for new renewable energy capacity in order for the region to

meet its targets of 674MW by 2010 and 1,850 by 2020 (or 708MW by 2010 and 1,862MW by 2020 in the draft RSS). Consequently, there is a need for a range of new renewable energy facilities such as the Brigg REP;

- The 2020 target for renewable energy generated in North Lincolnshire is 112MW. The Brigg REP would produce 40MW at maximum capacity and, as such, would be capable of providing over a third of the 2020 target for renewable energy in North Lincolnshire.

b) the development should be on developable previously developed land...

- The proposal site is unequivocally 'previously developed land', being the site of the former British Sugar factory.

c) a FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.

- The FRA included at Appendix 10-1 demonstrates that, subject to the implementation of an off-site flood mitigation and surface water attenuation scheme (the concept of which is presented in the FRA), the Brigg REP proposals can be delivered in a safe and sustainable manner.
- The additional compensatory flood storage introduced via the proposed flood mitigation scheme, would serve to reduce overall flood risk in the area generally.

10.4 Disturbance of Surface Water Regimes

10.4.1 Although the site has previously been developed and presently exhibits areas of hard surface cover, the proposed development would create large additional areas of roofs and hardstanding that would be impervious to rainwater. As such, in its developed form, the quantity of surface water run-off from the site would increase above that currently experienced, without the introduction of some form of mitigation works.

10.4.2 The surface water attenuation scheme described in the aforementioned FRA would serve to ensure that the runoff from the site, in its developed form,

would be regulated to a rate no greater than equivalent greenfield existing flows; such rates to be agreed with the Ancholme IDB and the Environment Agency. Adopting this approach would ensure that the existing land drainage regime local to the site would benefit from a reduction in peak flows from the development footprint, with a consequential reduction in overall flood risk.

- 10.4.3 It is proposed that roof water and runoff from all external hardstandings would be collected in a dedicated system of below-ground pipework. Flows emanating from all access roads, car parks and hardstandings would be discharged into this system via a network of trapped gullies and, where necessary, oil/petrol separators/interceptors and, ultimately, into the on-line attenuation pond constructed upon the western portion of the site. From this location regulated flows would be pumped into Scawby Beck.
- 10.4.4 As previously stated, the attenuation lagoon would be designed to accommodate development runoff attributable to the 1 in 100 year storm event (plus an allowance for climate change).
- 10.4.5 A scheme of rainfall harvesting is also proposed as part of the development, to generate a supply of 'grey water' for use in the renewable energy process and in wash-down activities. This introduction would also serve to reduce the quantity of runoff generated by the development that might otherwise exacerbate any existing flooding problems downstream of the development.

10.5 Contamination of Surface Water by Suspended Solids or by Other Pollutants

- 10.5.1 As noted previously, the proposed facilities would operate under the controls imposed by an Environmental Permit issued and regulated by the Environment Agency. One important aspect of the permit would be to ensure that there would be no pollution/contamination of the ground or surface waters surrounding the site.
- 10.5.2 The potential effects on surface water quality which should be considered in light of the development proposals are:

- i) the temporary effects, during construction, of large quantities of suspended solids, entering the off-site land drainage system;
- ii) the potential for oil/fuels/suspended solid contamination, emanating from vehicles using the roads, car parks and hardstandings;
- iii) foul effluent contamination, through a failure of any proprietary pumping facility that may be introduced at the site and any resulting surcharge/overspill.

10.5.3 Suspended solids exist in all surface water runoff, to some extent or another. However, during the earthworks phase of a construction project this situation can be exacerbated beyond acceptable limits, without appropriate precautionary measures being implemented.

10.5.4 The sources of these potential pollutants are invariably:

- i) run-off from exposed earthworks formations gathering soil particles, prior to entering the off-site land drainage systems;
- ii) earthmoving equipment and lorries transporting mud from the construction site onto the existing access roads.

10.5.5 Both of the above situations can be effectively managed through good working practices employed by the appointed contractor.

10.5.6 In the case of item i) above, peripheral grips cut around the earthworks operations would intercept contaminated run-off which could, in turn, be diverted to temporary settlement lagoons. Designed with appropriate retention periods, these lagoons would allow suspended solids to settle out from the run-off, prior to discharge into any off-site drainage systems.

10.5.7 In the longer term, the potential for oil/fuel contamination through vehicles using car parks and hardstandings etc. would be effectively mitigated by the introduction of EA approved oil separators into the permanent on-site surface water infrastructure. The routine maintenance of the oil separators would be scheduled as part of the Environmental Management Plan, prepared in respect of the REP facility. Accordingly the quality of surface water discharge from the site would be maintained at acceptable levels.

- 10.5.8 Foul flows generated by the proposals would be collected in a separate system of below-ground sewerage and discharged off site into the existing public drainage system serving the industrial area.
- 10.5.9 Depending upon the final design solution adopted and, in particular, the available depth to the receiving sewer system, it may be necessary to introduce a proprietary pumping station to 'lift' the effluent into the outfall manhole chamber.
- 10.5.10 Foul effluent overspill from any necessary proprietary package pumping facilities could result in contamination of the land drainage system in the area. This would be mitigated during the detailed design of the scheme, by introducing appropriate safeguards that would provide adequate warning regarding any such failures. These would include:
- i) telemetry apparatus providing the maintaining organisation with early warning of system failure;
 - ii) stand-by generator sockets in the event of an electrical failure;
 - iii) appropriate by-pass couplings as part of the facility to facilitate emergency over-pumping to tanker.
- 10.5.11 In light of the above, it can be seen that specific measures and practices would be employed at the site to ensure that the risk of contaminating surface water resources is minimised.

10.6 Conclusions

- 10.6.1 The proposed development does lie within an identified area of flood plain and has been subjected to a detailed Flood Risk Assessment. This indicates that the implementation of an on-site flood mitigation and surface water attenuation scheme would ensure that the risks posed to the development and the surrounding area could be managed to acceptable levels.
- 10.6.2 Surface water runoff from the proposed buildings and hardstandings would be managed in such a fashion so as to ensure that the resulting flows are regulated to the equivalent 'green field' runoff rate via the on-site storage ponds into Scawby Beck when conditions in the River Ancholme permit. This,

in turn, would ensure there would be no adverse disturbance to the existing hydrological regime local to the site.

- 10.6.3 The proposed development would not affect the water quality of the surrounding area as a result of the infrastructure that would be installed to service the site and the specific practices employed to manage runoff from the different parts of the development.