Appendix 8.4 –Surface Water Management Plan

The objective of this Surface Water Management Plan (SWMP) is to ensure all site works are conducted in an environmentally responsible manner so as to minimise any adverse impacts on surface water quality that may occur as a result of works associated with the development and operation of the Derryadd Wind Farm, incorporating the following specific objectives:

- Provide overall surface water management principles and guidelines for the construction phase of the Derryadd Wind Farm project;
- Address erosion, sedimentation and water quality issues; and
- Present measures and management practices for the prevention and/or mitigation of potential downstream impacts.

This SWMP has been prepared taking into consideration the findings and conclusions presented within the EIAR and Flood Risk Assessment (FRA). This SWMP and associated drainage strategy is prepared for the high-level project design at the planning stage and therefore will be subject to further refining and revision following granting of planning permission during the detailed design stage.

The key aspect of the proposed drainage system, as it is constructed, is that it must not impact on the existing drainage regime on the bog which is licenced and controlled in accordance with an EPA IPC Licence (EPA Ref. P0504-01 – Mountdillon Peatlands).

Existing Local Hydrology and Water Quality

The topography of the proposed development site is relatively flat peat site with some gently sloping drumlins/crag and tails rising above the peat canvass. All drumlins are orientated northwest to southeast in the study area. The general topography varies approximately from 45 to 59m AOD to the south of the study area (Lough Bannow Bog) and between 37 and 47m AOD in the Derryadd and Derryaroge Bogs.

The regional natural surface water drainage pattern in the environs of the proposed development site is shown on Figure 8.1 of the EIAR. The proposed development site is located within the River Shannon catchment. Figure 8.2 of the EIAR includes a significant number of unnamed streams but EPA reference numbers have been applied for identification purposes. Each of the streams flowing through or adjacent to the site has its own sub-catchment area. The delineation of these catchment boundaries is shown in Figures 8.2 and 8.3 of the EIAR.

The main regional surface water features include the following:

- The Ballynakill River (located approximately 6km north of the development);
- The River Shannon/Lough Ree (located approximately 5km west of the development);
- The Lough Bannow River (located approximately 2km south west of the development); and
- The Ledwithstown River (located approximately 2km south of the development).

A number of natural tributaries that flow into these rivers are located close to the proposed development site. The Derrygeel stream (EPA Ref: 15-1494) rises close to the northern area of the development and continues north joining additional tributaries before its confluence with the Ballynakill River. On the 15th May 2018, the channel of the Derrygeel stream (26_593) was dry where it made its way into the site. This stream had accumulated some flow by the time it exited the site boundaries.

Approximately 4km further to the west of the Bord na Móna landholding, a more karstic flow regime occurs. The landscape between Lough Ree and Lough Bannow Stream comprises a plateau (broad interfluve) which is gently undulating between 50 – 90m AOD. Few surface water features occur in this plateau however a number of small sinking streams and turloughs occur to the south of the area. Two turloughs, Cordara and Fortwilliam turlough, occur 3.5km and 4.7km to the south west of Turbine No. 17, respectively. Cordara turlough is connected to Fortwilliam turlough via a sinking stream and excavated/man-made drainage ditch. This stream and Cordara turlough are dry during the summer months with a permanent water body occurring at Fortwilliam. During the January 2017 and February 2018 site visits, the Cordara turlough was in flood. Water was noted discharging from the stream into Fortwilliam turlough. Discharge from Fortwilliam turlough is controlled via a sinkhole located on the western lip of the turlough.

The proposed wind farm is located within an operating peat extraction site. An extensive network of drainage channels is present throughout the peatland. The peatland is currently operated under an EPA IPC Licence (EPA Ref. P0504-01 – Mountdillon Peatlands).

Extensive site drains and main drains are present within the Bord na Móna property. The site and main drains within the currently IPC licenced site both store water and transmit it to main drains and ultimately to the settlement ponds. The storage capacity of run-off water in the drainage network lessens the impact of sediment mobilisation to receiving water, due to the low velocity of the water and the retention time in the drains. Final settlement occurs in the settlement ponds before discharging to the adjacent drains and streams.

This is illustrated in Figure 1 below.

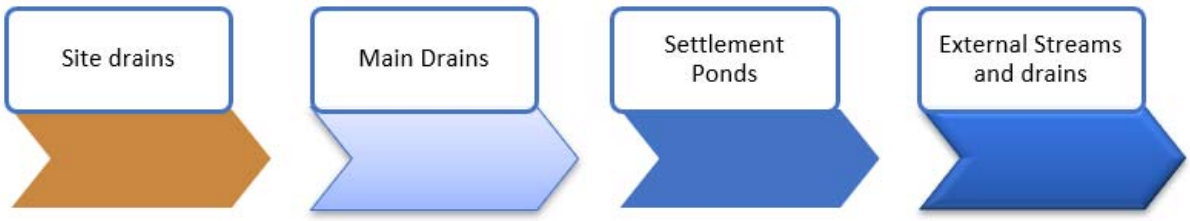

Figure 1: Drainage Hierarchy on Peatlands

Three streams/drainage channels were identified to be flowing through or adjacent to the proposed wind farm site (see Figure 8.2 of EIAR). The site and adjacent lands also include many man-made drains which flow to the watercourses identified in Figure 8.2 and assist in the drainage of peatland, reclaimed peatland areas under agricultural land use and forestry.

The EPA regularly monitors water bodies in Ireland as part of their remit under the Water Framework Directive (WFD) (2000/60/EC), which requires that rivers are maintained or restored to good/favourable status. A description of the basis for the EPA water quality monitoring programme is provided in Section 8.3.1.7 of the EIAR.

There are no EPA or WFD monitoring locations on the streams adjacent to the proposed site. However, samples were recorded on the River Shannon, 1km downgradient of the Lanesbourogh Power Station and 4km upgradient at Termonbarry village. The most recent EPA results for these monitoring points indicate that the quality of water at these locations is Q3 (Moderately Polluted) and Q3-4 (Slightly Polluted) (or Poor Status based on the WFD Status classification). Samples were also recorded on the Farran River located 5km to the west of the proposed development. The most recent EPA results for these monitoring points (West of Curry Bridge) indicate that the quality of water at this location are Q3 (Moderately Polluted) and Q3-4 (Slightly Polluted) (or Poor Status based on the WFD Status classification).

The majority of EPA monitoring points on the River Shannon indicate that the overall water quality in this area is Moderately Polluted and that the water quality upstream of the development is Slightly Polluted. The overall status of surface water/rivers in the vicinity of the site is Poor Status. This

classification is based on a low macroinvertebrate value (Q-Value) according to WFD Ireland (www.wfdireland.ie).

Site Specific Surface Water Quality

Surface water monitoring is conducted at the Mountdillon site on a regular basis as part of compliance with the facility's IPC Licence. The results for surface water sampling are presented in Tables 8.3 and 8.4 of the EIAR and show that the results for parameters tested were within the Licence discharge limits. All samples were taken from surface water channels during periods of low flow (low dilution factor), these results are as expected for the natural background environment in this area (in particular, elevated levels of ammonia and suspended solids would be expected in a peat soil/subsoil environment). These results provide a baseline set of results which can be used for comparative studies during the lifetime of the proposed wind farm.

Field monitoring was carried out as part of the EIAR study in January 2017 and March 2018, the results of which are included in Tables 8.5 and 8.6 of the EIAR. The low conductivity values recorded indicate that the Ballynakill and Lough Bannow Rivers are predominately fed by surface water run-off. Further to the west, the stream monitoring on a tributary to Lough Bannow River (Ref. 26_280) and Fortwilliam stream indicate an increasing component of groundwater flow. The St. Martins springs on the shores of Lough Ree have similar conductivity values to Fortwilliam Turlough. The locations of surface water monitoring carried out are shown in Figures 8.4 and 8.5 of the EIAR.

Existing Site Drainage Pattern

The surface of the cutover bog is drained by a network of parallel northwest-southeast generally orientated field drains that are typically spaced every 15 – 20m. The parallel running bog field drains are approximately 1 – 1.5m deep and in most areas, they intercept the mineral subsoil underlying the peat. These field drains mostly feed into larger surface water drains which drain the main catchments across the three bog formations. The surface water drains are primarily in a northwest-southeast orientation but there are a number of shorter cross drains which intersect the small field drains. There are also a number of pump stations located at low points in the larger drains to direct the surface water to the outfall locations and boundary drains. There are various outfalls on the bog boundaries which comprise mainly pumped outfalls but also some areas of gravity drainage. Surface water draining/pumped from the site is typically routed via settlement ponds prior to discharge into off-site drainage channels which flow into the River Shannon.

In the Derryaroge Bog, there are three pumped outfalls along the northern boundary of the bog which flow a short distance northward into the River Shannon as well as one pump along the eastern

boundary and one along the western boundary which flow via off-site drainage channels northwards into the River Shannon. A small area in the northwest of the bog is drained southwards under gravity where the run-off is collected in a boundary drain which flows through an existing settlement pond northward into the River Shannon.

Similarly, in the Derryadd bog formation, the northern area of the bog drains towards a pumped outfall on the northern boundary which discharges into the main outfall running behind the Mountdillon Main Workshop. The southwest bog area drains towards a pumped outfall in the southwest corner of the bog where the outfall is directed into an existing watercourse via a settlement pond. The east and southeast of the Derryadd bog drain towards a new pump station on the eastern boundary of the site which discharges northwards into an existing drainage channel off-site.

In the Lough Bannow Bog formation, there are pumped outfalls located along both the northern and southern boundaries. The northeast portion of the bog drains towards a pump located at the extreme northeast corner of the bog. The largest central area of the bog is drained towards a pumped outfall on the northern boundary of the site close to the R398 road. The northwest of the Lough Bannow Bog is gravity drained towards the northwest boundary of the bog formation discharging off-site through a settlement pond northward under the R398. To the south of the railway line running east-west through the bog, there are two separate catchment areas which drain southwards off-site.

Preliminary Surface Water Drainage Design Concept

Proposed drainage measures are shown on the site layout plans (Drawing No.'s 10325-2006 to 10325-2012). There is a combination of floating and founded roads proposed across the development and the surface level of the finished roads will generally be 0.5 – 1.0m above the existing ground level. The turbine foundation pads will typically be 1.5 – 2.0m above the existing ground level. It is proposed to construct swales adjacent to the roads, crane pads and turbine pads to provide drainage for surface water run-off from the proposed development. Typical road cross sections are shown on Drawing No. 10325-2023. Check dams will be provided in the swales to reduce the velocity of surface water run-off.

The existing drainage network in the bogs will be maintained in so far as is possible to minimise the impact on the existing surface and groundwater regime from the proposed development and to prevent ponding. Existing flow channels shall be maintained, and road crossing culverts will be constructed as required to allow continuity of flow. Natural flow paths will not be interrupted or diverted in such a manner as to give rise to erosion or instability of soils caused by an alteration in

water movement either above or below ground. The key concept will be to keep clean water clean by minimising disturbance to the existing established drainage features.

The layout of the site has been designed to collect surface water run-off from roads, crane pads and hardstanding areas and discharge to peat settlement ponds within the boundary of the proposed development. A typical detail of the proposed settlement ponds is shown in Drawing 10325-2024. Run-off will discharge from the settlement ponds into the existing bog drainage network at appropriate greenfield run-off rates. There is no proposed increase in the discharge from the overall site. There will be no direct discharges to any existing natural watercourse.

It is proposed to decrease the run-off quantity by using permeable road construction and crane pad areas to maximise natural infiltration to ground and by providing measures to slow down and attenuate surface run-off by using check dams and settlement/storage ponds. The surface water sedimentation/storage ponds will have the purpose of limiting the runoff from the proposed development to greenfield run-off rates, promoting infiltration and improving the quality of run-off by removing sediment. It is also noted that the majority of the current bog drainage network discharges from site through existing settlement ponds in and around the site boundary which provides a two-stage treatment process.

During the construction phase, all run-off from construction areas will be controlled and treated to reduce suspended solids concentration prior to being discharged into the existing drainage network. A number of temporary peat settlement ponds will be established during the construction phase along roadways and in areas of high construction activity to minimise silt laden run-off entering the drainage network. Those not required permanently shall be reinstated upon completion of the main construction works.

Settlement ponds are proposed alongside hardstanding areas to limit the rate of discharge from the proposed development areas. Additional ponds will be provided during the construction stage, as required, to accommodate the additional levels of sediments anticipated during this stage. Indicative locations of the permanent settlement ponds are shown on Drawing No.’s 10325-2005 to 10325-2012.

The general provisions for attenuation outlined herein will provide sufficient storage capacity for the proposed development areas. It is noted that the control and regulating of surface water discharge from the overall bogs is ultimately determined by the IPC Licence for the bog and the drainage for

the proposed development will be required to ensure ongoing compliance with the limits set in the IPC Licence.

The surface water discharge system has been designed as follows:

- The surface water attenuation/storage ponds will cater for the 1:100-year storm event; and
- Allowable outflow from the proposed development shall be such that the bog discharge rates managed as part of the IPC Licence will be maintained.

The quality of run-off from proposed development surface areas will be improved by the fact that the surface water attenuation/storage ponds will also act as settlement ponds. During construction activities, oil interceptors will be installed at machinery refuelling locations to eliminate any fuel discharge into the surface water network and spill kits will be kept in locations adjacent to machinery activities (such as at crane pads) in case of emergency.

Subject to planning conditions and prior to commencement of construction activity, this drainage design including construction specific measures will be required to be developed further by the appointed Contractor and the finalised construction stage drainage design (typically incorporated in a Construction Environmental Management Plan (CEMP)) will be required to be submitted to the client for approval.