LOCHLUICHART WIND FARM EXTENSION II

APPENDIX 13.A

OUTLINE
WATER CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

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1 INTRODUCTION

This outline Water Construction Environmental Management Plan (WCEMP) forms an appendix to the Environmental Impact Assessment Report (EIA Report) for Lochluichart Wind Farm Extension II (the Development). This WCEMP will be incorporated into the Construction Environmental Management Plan (CEMP) that will be maintained and updated throughout the construction process as a live document. The CEMP will be augmented by design specifications and construction documentation and will provide comprehensive information on environmental management appropriate to the stage of development.

Whilst the preparation of the CEMP is the responsibility of the construction contractor, the outline WCEMP presented in this document is intended to demonstrate measures that will be used across the Development site to adequately protect the hydrological environment and related resources. Detailed proposals for such measures will be documented prior to construction and will provide the same or greater protection for the water environment as those described in this document. The measures are proportionate to the risk and, where greater risk is highlighted at specific locations prior to construction, specific measures would be agreed for those locations. This document provides a high level outline WCEMP, and as part of the iterative process, it would be further developed into a CEMP throughout the construction programme, which will detail the exact location of measures to protect the hydrological environment.

The methods set out in the WCEMP are based on good practice measures agreed with the Scottish Environment Protection Agency (SEPA) for several constructed wind farms and the following guidance:

- Forestry Commission, 'The UK Forestry Standard, 2017[1]';
- Scottish Renewables (SR) and SEPA. Guidance on the Assessment of Peat volumes, Reuse of Excavated Peat and the Minimisation of Waste (2012)[2];
- Scottish Natural Heritage, Good Practice During Wind Farm Construction, (2013)[3];
- The Construction Industry Research and Information Association (CIRIA), 'Environmental Good Practice On Site (C741)' (2015)[4]; and
- CIRIA, 'Control of Water Pollution from Construction Sites (C532)' (2001)[5].

The WCEMP takes into account specific activities during the construction and operational phases of the Development, including:

- Access roads;
- Borrow workings;
- Turbine foundations; and
- Hardstanding areas and buildings (including crane hardstanding, construction compounds and associated infrastructure).

The appropriate methodologies to cover water control and the means of drainage from all hard surfaces and structures within the site are described in the following sections.

[1] The UK Forestry Standard: Forests and Water [Online] Available at: https://www.forestry.gov.uk/pdf/FCFC001.pdf/$FILE/FCFC001.pdf (Accessed 07/08/2018)
[2] SR and SEPA (2012) Guidance on the Assessment of Peat volumes, Reuse of Excavated Peat and the Minimisation of Waste [Pnline] Available at: http://www.scottishrenewables.com/media/uploads/publications/a4_developments_on_peatland.pdf (Accessed 07/08/2018)
[3] SNH (2013) Good Practice During Windfarm Construction [Online] Available at: http://www.snh.gov.uk/docs/A1168678.pdf (Accessed 07/08/2018)
[4] The Construction Industry Research and Information Association (CIRIA), (2015), Environmental Good Practice on Site Guide (C741), CIRIA: London
[5] CIRIA, (2001), Control of Water Pollution from Construction Sites (C532), CIRIA: London.

2 THE MANAGEMENT OF SEDIMENT AND SURFACE WATERS

This section addresses the management of sediment and surface water run-off generated during the construction phase of the Development, through good practice construction techniques.

Major construction works will be minimised during heavy precipitation events.

Drainage from the site will include elements of Sustainable Drainage Systems (SuDS) design, where appropriate. SuDS replicate natural drainage patterns and have a number of benefits:

- SuDS will attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream;
- SuDS will treat run-off, which can reduce sediment and pollutant volumes in run-off before discharging back into natural drainage network; and
- SuDS measures, such as lagoons or retention ponds, correctly implemented will produce suitable environments for wildlife.

2.1 LOCATION OF SILT TRAPS AND SILT MATTING

Silt traps may be utilised to trap and filter sediment-laden run-off from excavation works at the Development, including turbine bases and access roads. They will be installed in drainage ditches but will be sited to avoid slopes with a gradient greater than 1 in 20.

Good practice will be followed prior to placement of silt traps adjacent to watercourses. Silt matting may be placed at the outfall of settlement lagoons to filter sediment during times of heavy rainfall.

The silt traps and silt matting will be monitored by the Ecological Clerk of Works (ECoW) and replaced when necessary.

Plates 1, 2 and 3 of this document display typical silt fencing, silt traps and silt matting.

Plate 1: Typical silt fencing

Plate 2: Typical silt traps

Plate 3: Typical silt mat to be placed at lagoon outfalls

2.2 LOCATION OF CHECK DAMS

Check dams will be installed within drainage ditches at regular intervals, where appropriate. Check dams will facilitate the settlement of suspended solids by slowing the flow of water within the drainage ditches. Appropriately sized stone pitching will be used within the dam in order to provide a rough surface for water within the drainage ditch to pass over.

Plate 4 of this document displays a typical check dam.

Plate 4: Typical check dams - to be installed in drainage ditches adjacent to the access track

2.3 LOCATION OF SETTLEMENT LAGOONS

Settlement lagoons will be implemented, where appropriate, at turbine excavations.

All settlement lagoons will be actively managed to control water levels and ensure that any runoff is contained, especially during times of rainfall. If required to achieve the necessary quality of the final run-off, further measures may include the use of flocculent to further facilitate the settlement of suspended solids. The appropriateness of flocculent use would be discussed with SEPA prior to its introduction into settlement lagoons

Plate 5 of this document displays a typical settlement lagoon and flocculent station.

Plate 5: Typical lagoon and flocculent station

2.4 OUTFLOW MONITORING FROM SETTLEMENT LAGOONS

Settlement lagoon outflow will be regularly inspected and discharge may be pumped, when required, for maintenance purposes. Any pumping activities will be supervised and authorised by the Infrastructure Contractor's Project Manager.

Treated water will be discharged onto vegetated surfaces and directed away from surface watercourses. Within all the catchments, irrigation techniques, which may include the use of perforated discharge hoses or similar, will be employed to rapidly distribute discharge across a vegetated slope. This will be carried out in consultation with the ECoW.

Plate 6 of this document displays typical pumping operations.

Plate 6: Typical 'Siltbuster' and settlement lagoon

2.5 PROVISION FOR STORM EVENTS

The site itself is not considered to be at risk from flooding. In extreme storm events, there would be elevated levels of run-off from the hardstanding elements of the Development relative to greenfield flow rates, which has the potential to contribute to down-stream, off-site, flood risk. The areas of new hardstanding, in terms of the percentage of the relevant catchments that may be affected, are small.

In the baseline scenario, the water table is not at the ground surface, and hence some infiltration would be expected. The Development proposals could raise the water table, and therefore infiltration would reduce. Notwithstanding this, measures are proposed in this document that would limit run-off rates.

Temporary storage volume for storm run-off from the turbine foundations and crane hardstanding areas would be provided via settlement lagoons.

Along the access tracks, drainage channels on the down-slope would shed track run-off to adjacent rough ground approximately every 30 m, to attenuate flow and allow natural filtration to remove sediments. In areas within 50 m of a watercourse marked on an Ordnance Survey 1:50,000 scale map or where cross-slopes exceed 1 in 20, drainage channels will be bunded and outflow will be monitored daily in areas with on-going construction activity.

Appropriate licensing and discharge consents will be sought (under Water Environment (Controlled Activities) (Scotland) Amended Regulations 2013 (CAR)[6]) before the construction phase of the Development.

2.6 FOUL DRAINAGE

The substation building may house a single toilet facility and / or hand basin for visiting maintenance staff during the operational phase. Should this facility be required rainwater will be collected from the roof of the building via a gutter and inlet pipe to fill a rain water harvesting tank. Waste will be held in a closed system or a septic tank and pumped out as necessary via a tanker. The system shall be designed and approved by SEPA prior to construction.

[6] The Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013 [Online] Available at: http://www.legislation.gov.uk/ssi/2013/176/pdfs/ssi_20130176_en.pdf (Accessed 17/05/2016)

Effluent and waste from onsite construction personnel will be treated at a package sewage treatment plant or a septic tank and discharged into a properly designed and sized drainage field, in accordance with GPP4. The system will be designed prior to the construction phase of the Development.

3 THE MANAGEMENT AND MOVEMENT OF FRESH CONCRETE

If concrete batching is carried out on-site, rather than being imported to the site ready-mixed, the following management measures are proposed.

3.1 ACCIDENTAL SPILLAGE WITHIN CONSTRUCTION COMPOUNDS

The construction compound will have a bunded area and this area will be underlain by an impermeable ground membrane layer. The bund will have a 110 % capacity to attenuate stored liquids (including fresh concrete). This will reduce the potential for accidental spillages to contaminate surface water or groundwater. An appropriately sized spill kit(s) will be provided and maintained on site. This will contain materials, such as absorbent granules and pads, absorbent booms and collection bags. These are designed to halt the spread of spillages and will deployed, as necessary, should a spillage occur elsewhere within the construction compounds.

3.2 ACCIDENTAL SPILLAGE OUTSIDE CONSTRUCTION COMPOUNDS

Speed limits for vehicles transporting concrete will be set at a maximum of 15 miles per hour (mph) and will be monitored. Maximum vehicle load capacities will not be exceeded. Although tracks will be maintained in good condition, vehicle loads will be reduced when a rougher surface is identified prior to track maintenance.

Spill kits will also be located at strategic points across the site, as displayed in Plate 7.

Plate 7: Spill Kits to be located across the Development

Measures to manage fresh concrete during pouring operations are described in Section 4.4: Concrete Pouring for Turbine Foundations.

3.3 VEHICLE WASHING

There will be a wash-out facility within the construction area consisting of a sump overlain with an impermeable geosynthetic membrane. The geosynthetic membrane will filter out the concrete fines leaving clean water to pass through to the sump. The sump water will be pumped to a licenced carrier and taken off-site for approved disposal.

No washing of concrete-associated vehicles will be undertaken outside the wash out facilities, and the area will be signposted, with all site contractors informed of the locations.

The frequency of concrete plant washout may also be reduced through the use of retarders.

Plate 8 displays a typical concrete wash-out facility.

Plate 8: Typical concrete washout facility

In the event that plant and wheel washing is required, dry wheel wash facilities and road sweepers will be provided to prevent (as far as is practicable) mud and debris being carried from within the site onto the public road.

Signage will be put in place to direct all vehicles to use wheel wash facilities. The track section between the wash facility and the public road will be surfaced with tarmac or clean hardcore and the area surrounding the facilities will be kept clean and in good condition.

The wheel wash facility, which will work on a closed cycle, shall be operated throughout the construction period. Wheel wash facilities will be located within a designated area of hardstanding at least 50 m from the nearest watercourse or 20 m from the nearest surface drain. It is expected that these facilities shall be sited adjacent to the site entrance, as shown in Plate 9.

Should debris be spread onto the site access or public road adjacent to the wind farm, then road sweepers will be quickly utilised to clean affected areas. Loose debris will also be periodically removed from on-site tracks. Also, all HGVs taking construction materials to and from the site will be sheeted to prevent the spillage or deposit of material on the highway.

Plate 9: Example of a dry ramp wheel wash facility

3.4 CONCRETE POURING FOR TURBINE FOUNDATIONS

Methods to protect surface and groundwater from the batching and transportation of concrete are considered above.

To prevent pollution it is important that all concrete pours are planned and that specific procedures are adopted where there may be a risk of surface water or groundwater contamination, in accordance with CIRIA C532. These procedures will include:

- Ensuring that all excavations are sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system; and
- Ensuring that covers are available for freshly placed concrete to avoid the surface of the concrete washing away during heavy precipitation.

Typical foundation shuttering is shown in Plate 10 of this document.

Plate 10: Typical wooden shuttering – to be deployed around the turbine foundations during concrete pours

The excavated area will be back-filled with compacted layers of graded material from the original excavation, where this is suitable, and capped with peat or soil. Locally, around the turbines, the finished surface will be capped with crushed aggregate to allow for safe personnel access around the base of the turbine. The management of run-off from these areas is described in Section 3: The Management of Sediment and Surface Waters.

4 HYDROCARBON CONTAMINATION

4.1 VEHICLE MAINTENANCE

During the operation of the excavations, excavation machinery will be regularly maintained to ensure that there is minimal potential for fuel or oil leaks / spillages to occur. All maintenance will be conducted on suitable absorbent spill pads to minimise the potential for groundwater and surface water pollution. All machinery will be equipped with drip pans to contain minor fuel spillage or equipment leakages.

Appointed refuelling personnel will be trained in the correct methods of refuelling on site to ensure that pollution incidents are prevented and a quick response plan is implemented, should a spill occur, to minimise the impact of spills.

Plates 11 and 12 of this document display examples of dip pans and bunds.

Plates 11 and 12: examples of drip trays and bunds

4.2 CHEMICAL STORAGE

Potentially contaminating chemicals stored on site will be kept within a secure bunded area to prevent any accidental spills from affecting hydrological resources. The bunded area will be within the construction compound and will be underlain by an impermeable ground membrane layer to reduce the potential pathways for contaminants to enter watercourses and groundwater.

Oil storage areas will be covered in order to prevent rainwater collecting within the bunded area.

Further detail is presented in Section 4.1: Accidental Spillage within Construction Compounds.

The chemicals storage area would be kept secure to prevent theft of vandalism. A safe system for accessing the storage area would be implemented by the Construction Contractor.

5 BORROW WORKINGS DRAINAGE

Existing borrow workings used for the operational forestry may be used for the Development, while new borrow pits may be opened. The following drainage measures will adequately protect the hydrological and hydrogeological resource.

5.1 PRE EARTHWORKS DRAINAGE

Temporary interception bunds and cut-off drainage ditches ('clean water drains') will be constructed upslope of the borrow pits and cuts to prevent surface water runoff entering the excavation.

SuDS measures, such as swales or retention ponds, will be implemented to convey and attenuate excess surface water flow away from borrow pits and excavations. Swales will be kept to a minimum length, depth and gradient with check dams, silt traps and buffer strips also utilised to minimise erosion, sedimentation at peak flows, where appropriate.

Swales to collect runoff will be placed on the downslope of borrow pits and overburden / stockpiles and will be designed to treat potentially silty runoff before discharging back into the drainage system.

The use of peat and soil stockpiles will be minimised by earthworks planning. However, where stockpiles are used, silt fences and straw bales wrapped in hessian or semi-permeable lining can be used to intercept sediment laden surface runoff in addition to swales and infiltration trenches.

5.2 EARTHWORKS DRAINAGE

Due to the low permeability of the overlying peaty soil deposits, it is unlikely that groundwater ingress from peat will be significant in borrow pit or earthworks areas. However, the bases of borrow pits and earthworks will have a gravity drainage system and all water will drain to an adequately sized sump.

If dewatering of borrow pits or excavations is necessary, waste water will be treated by designed settlement lagoons and retention ponds. 'Siltbusters' will be used to treat pumped / surplus water from lagoons or retention ponds during periods of heavy or persistent rainfall.

Flocculent could be employed in settlement lagoons and retention ponds to further facilitate the settlement of fine suspended solids before waste water is discharged to rough vegetation.

Waste water discharge onto vegetated surfaces from borrow workings and earthworks areas will be directed away from watercourses and drainage ditches to avoid direct and extended the treatment phases. Any sediment suspended within the treated water will be deposited amongst the rough surface vegetation. The Contractor's site manager will ensure that excessive sediment on vegetated surfaces does not accumulate.

Silt mats may be used at the outfalls of settlement lagoons and retention ponds to further aid the settlement of sediment from earthworks drainage.

During the operation of the borrow workings and during earthworks operations, excavation machinery will be regularly maintained to ensure that there is minimal potential for fuel or oil leaks / spillages to occur. All maintenance will be conducted on a bunded geotextile layer to reduce the potential for groundwater and surface water pollution.

5.3 MANAGEMENT OF DRAINAGE FROM SURPLUS MATERIALS

Careful consideration will be given to the location of topsoil and subsoil storage areas for all areas of the Development during construction. Storage areas will be either in a flat dry area away from watercourses, or be protected by the addition of cut off drains above the storage areas to minimise the ingress of water.

Mineral soils will not be allowed to dry out and silt fences and mats will be employed to minimise sediment levels in run-off.

All stockpiled material will be stored at least 50 m from watercourses in order to reduce the potential from sediment to be transferred into the wider surface water system and will be regularly inspected to ensure that erosion of the material is not taking place.

5.4 DUST SUPPRESSION AND CONTROL

Water needed for dust suppression on the haul roads during periods of dry weather and the compound vehicle wash will be clean water. Clean water may be obtained from re-circulated clean or treated drainage waters.

Where required, water may be extracted from local watercourses or groundwater. In these instances, the Contractor will liaise with SEPA beforehand to agree abstraction locations, rates and CAR authorisation requirements.

Good practice measures will be adopted during construction to control the generation and dispersion of dust such that significant impacts on neighbouring habitats will not occur. The hierarchy for mitigation will be prevention, suppression then containment.

The following mitigation measures will be implemented to control the movement of dust within the Development site:

- Excavation and earthworks areas will be stripped as required in order to minimise exposed areas;
- During excavation works, drop heights from buckets will be minimised to control the fall of materials reducing dust escape;
- Completed earthworks and other exposed areas will be covered with topsoil and re-vegetated as soon as it is practical in order to stabilise surfaces.
- During stockpiling of loose materials, stockpiles shall exist for the shortest possible time;
- Material stockpiles will be low mounds without steep sides or sharp changes in shape;
- Material stockpiles will be located away from the site boundary, sensitive receptors, watercourses and surface drains;
- Material stockpiles will be sited to account for the predominant wind direction and the location of sensitive receptors;
- Water bowsers will be available on site and utilised for dust suppression during roadworks/ vehicle movements when and where required;
- Daily visual inspections will be undertaken to assess need for use of water bowsers; and
- Daily visual inspections will be undertaken to assess the condition of the junction of the site track with the A835 and its approaches.

6 ACCESS TRACK CONSTRUCTION AND USE

Prior to access track construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow so that site drainage design will maintain hydrological connectivity. Site drainage design will be produced in advance of construction.

Floating roads are unlikely to be used, as peat depth is rarely greater than 0.5 m. Set out in the following sections are measures that will be incorporated into the design and installation of the access tracks.

6.1 MANAGEMENT OF SURFACE WATER

Access tracks will be designed to have adequate cross fall to avoid ponding of rainwater and surface run-off. Run-off from the access tracks and existing drainage ditches will be directed into swales that will be designed to intercept, filtrate and convey the runoff.

Check dams will be installed within the swales and existing drainage ditches in order to increase the attenuation of run-off.

Permanent swales and drainage ditches adjacent to access tracks will have outlets at specified intervals to reduce the volume of water collected in a single channel and,

therefore, reduce the potential for erosion. Further measures could include the use of settlement ponds or possibly flocculent to further facilitate the settlement of suspended solids.

The Infrastructure Contractor would be responsible for the management of all surface water run-off, including the design and management of a drainage scheme compliant with SuDS principles. This may include settlement lagoons and retention ponds, incorporating natural or assisted attenuation.

6.2 LOOSE TRACK MATERIAL

Loose material from the use of access tracks will be prevented from entering watercourses by utilising the following measures:

- Silt fences will be erected between areas at risk of erosion and watercourses;
- Silt fences and swales will be inspected daily and cleaned out as required to ensure their continued effectiveness;
- Silt matting if required will be checked daily and replaced as required;
- Excess silt will be disposed of in designated areas at least 50 m away from any watercourses or drainage ditches;
- Cut off ditches will be implemented on slopes greater than 1 in 20;
- Swales and drains will be checked after periods of heavy precipitation;
- The inlets and outlets of settlement lagoons, retention basins and extended detention basins will be checked on a daily basis for blockages;
- The access tracks will be inspected on a daily basis for areas where water collects and ponds; and
- An example of a semi-permeable geotextile layer is shown in Plate 13 of this document.

Plate 13: semi-permeable geotextile layer

6.3 MATERIAL EXCAVATED DURING TRACK CONSTRUCTION

Material excavated during track construction will either be stored adjacent to the track or within agreed spoil deposition areas and compacted in order to limit instability and erosion potential. Peat will not be allowed to dry out and silt fences will be employed if required to minimise sediment levels in run-off. Material will be stored at least 50 m from

watercourses in order to reduce the potential for sediment to be transferred into the wider hydrological system.

Typical overburden stockpile measures are shown in Plate 14 of this document.

Plate 14: Typical overburden stockpile measures

6.4 WATERCOURSE CROSSINGS

The use of in-situ fresh concrete in the construction of watercourse crossings will be avoided where possible by the use of pre-cast elements. Existing culverts may be upgraded and anticipated to be replaced with suitable pre-cast culvert designs. Ready-made concrete 'box style' or bottomless arched concrete or plastic culverts will be used.

Prior to access track construction, site operatives will identify flush areas, depressions or zones which may concentrate water flow. These sections may be spanned with plastic pipes if required to ensure hydraulic conductivity under the road, and reduce water flow over the road surface during heavy precipitation.

Culverts will be designed based on best practice[7],[8],[9] in order to minimise effects of developments on the natural integrity and continuity of water courses. The design will incorporate the following criteria:

- Culverts will be well bedded to avoid settlement and protected by an adequate cover of road material;
- The substrate and side/ head walls will be reinforced in order to prevent erosion;
- The culverts will be designed such that it does not cause a barrier to movement of fish or other aquatic fauna;
- Culvert floors will have the same gradient (not exceeding a slope of 3 %) and level, and carry similar bed material and flow, as the original stream;
- There shall be no hydraulic drop at the culvert inlet or outlet;
- The width of the culvert will be greater than the active channel width of the watercourse;
- Culverts will be used to conduct water under the wind farm tracks; and
- Any fences or screens fitted on the inlet or outlet of the culvert will be designed to allow at least 230 mm of space between the bars of the screen of fence, up to the high water level.

[7] *Forest and Water Guidelines, 5th Edition,* Forestry Commission, 2011 [Online] Available at: http://www.forestry.gov.uk/website/forestry.nsf/byunique/infd-8bvgx9 (Accessed 17/05/2015)

[8] *Construction of River Crossings,* SEPA, 2008 [Online] Available at: http://www.sepa.org.uk/planning.aspx (Accessed 17/05/2016)

[9] Culverting of Water courses: Position Statement, SEPA, 2006 [Online] Available at: http://www.sepa.org.uk/planning/engineering-water_environments.aspx (Accessed 17/05/2016)

7 FELLING MEASURES

The following measures will be implemented during tree felling as part of the Development to ensure that harvesting methods are in accordance with good practice:

- Timber will be stacked on drier slopes at least 50 m from watercourses and not blocking roadside drains;
- Brash will not be stockpiled within 50 m of a watercourse;
- The area within 50 m of watercourses shall be regarded as a "sensitive area";
- During felling operations within "sensitive areas", silt traps or temporary dams will be used in local ditches to prevent sediment entering watercourses, and silt fences will be constructed locally between working areas and watercourses;
- Any work in "sensitive areas" to be approved by the Infrastructure Contractor's Project Manager and the Ecological Clerk of Works;
- If felling is to occur in the riparian zone (the interface between land and a flowing surface water body) of a watercourse, trees will be felled away from the watercourse;
- Brash mats will be used for vehicle trafficking to protect bare soils;
- Silt traps will be installed in existing and new drainage ditches downstream of felling areas and construction activities but will be sited to avoid slopes with a gradient greater than 1 in 20;
- Silt fences and traps will be cleaned out on a regular basis and following heavy precipitation; and
- Silt matting if used to be checked on a daily basis and replaced as required.

8 HANDLING OF MINERAL SOILS

8.1 GENERAL GOOD PRACTICE MEASURES

The excavation of each turbine foundation will generate excess material, the majority of which will typically be mineral soils. Excess material from other infrastructure will also be predominantly mineral soils.

As mentioned in Section 7: Access Track Construction and Use of this WCEMP, floating roads are unlikely to be used at the Development, as peat depth is generally less than 0.5 m.

At turbine foundations topsoil will be stripped separately to sub soils, where possible aiming to keep the top layer of turf intact. This material will be stored adjacent to the base working area and will be limited in height to 2 m to minimise the risk of overheating. Subsoil will then be stripped and stored, keeping this material separate from the topsoil in accordance with guidance by SNH and SEPA.

In accordance with BS 3882 'Specification for Topsoil and Requirements for Use', any long term stockpiling of topsoil should not exceed 2.0 m in height with a maximum side slope of 1 in 2. In its dry non plastic state, topsoil can be stockpiled in a 'loose tipped' manner and tracked in a compactive method reducing water ingress. Wetter soils can be stored in windrows for drying and later stockpiled for re-use. The re-wetting of peat will be carried out, if there is a potential risk of the peat drying out.

8.2 MEASURES TO PROTECT GROUNDWATER DEPENDENT TERRESTRIAL ECOSYSTEMS AND ABSTRACTIONS

The following measures will ensure that water quality and the flow supply of groundwater and near-surface water are maintained during the construction and operational phase of the Development. Key measures include:

- Silt traps may be deployed to trap and filter sediment-laden run-off throughout the construction phase of the Development;

- Settlement lagoons may be constructed and actively managed to control water levels and ensure that any runoff is contained, especially during times of rainfall. The location and management of the settlement lagoons is essential and will not be sited within vulnerable wetland areas where they may cause drying out and direct loss of habitat;
- Flush areas, depressions or zones which may concentrate water flow, will be identified in advance of construction and a suitable drainage design shall be developed to address each location, to ensure hydraulic connectivity
- Site drainage design will avoid any severance of saturated areas to ensure hydrological connectivity is maintained. Site drainage design will be produced in advance of construction;
- The length of time excavations are kept open and the duration of any dewatering will be minimised;
- All excavations will be sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. However, construction good practice will be followed to ensure that fresh concrete is isolated from the dewatering system; and
- Water from dewatering activities are generally treated by settlement lagoons and will be discharged onto vegetated surfaces, ensuring no net loss of water from the hydrological system. If ponding of water is observed during the discharge onto vegetated surfaces, additional measures may be employed.

9 DISPOSAL OF WASTE MATERIALS

Waste such as timber, metal, general waste *etc*. will be segregated on-site, and disposed of in a licenced waste facility off-site.

10 MONITORING PROGRAMME

A surface water and groundwater monitoring programme will be established prior to the construction phase of the Development. An indicative monitoring programme is set out below.

10.1 SURFACE WATER MONITORING

Surface water monitoring would be undertaken at locations on the principal watercourses downstream of the Development infrastructure and upstream of other non-natural influences, where possible.

Regular visual inspections of surface watercourses are proposed, especially during major excavation works, as these allow rapid identification of changes in levels of suspended solids that could indicate construction related effects are occurring upstream. Potential effects can then be investigated and remedial action taken to prevent further effects, if necessary.

To supplement the visual inspections, it is anticipated that there would be a number of surface water monitoring points for extractive sampling and analysis, Details will be agreed in advance of construction.

The following sampling frequency is proposed in order to establish baseline hydrochemical conditions of surface water constituents:

- Once every month for twelve months prior to the construction phase.

The following sampling frequencies are proposed in order to monitor surface water conditions against baseline conditions:

- Once a week during ground breaking works and concrete works, e.g., access track construction, turbine foundations;

- Twice a month during minor construction works; and
- Twice a month for three months then once a month for a further 3 months during the post construction phase.

Establishing baseline conditions for surface waters will enable any trends in levels of critical parameters to be assessed and deviations from the norm identified and rectified through water management measures.

10.2 MONITORING REPORTING

The results of all laboratory analysis of water samples will be tabulated and reports submitted to the client and contractor on a monthly basis.

10.3 OPERATIONAL PHASE MONITORING

Sampling and testing will be carried out during the operational phase when any major maintenance or construction works are undertaken that may give rise to pollution of surface water.

10.4 MONITORING PROGRAMME SUMMARY

Any activity proving detrimental to water quality will be detected at the earliest opportunity during the construction and operational phases of the Development. This will allow action to be taken to prevent any further effect on water quality.

11 DECOMMISSIONING

During the decommissioning phase of the Development it is anticipated that access tracks would be removed and the area allowed to naturally re-vegetate. A full drainage reinstatement plan would be developed in advance of decommissioning the wind farm. Decommissioning activities will be undertaken in accordance with good practice at the time, and agreed with the relevant consultees in advance of the works commencing.

12 CONCLUSIONS AND RECOMMENDATIONS

The purpose of this outline WCEMP is to detail appropriate water management measures to control surface water run-off, and drain infrastructure during the construction and operation of Lochluichart Wind Farm Extension II. The measures detailed throughout this report would ensure that any effects on the surface and groundwater environment are minimised.

This document would be adapted to meet the additional requirements of the construction contractor and Ecological Clerk of Works, when appointed, to ensure that all measures implemented are effective and site-specific.

The WCEMP is considered to be a live document, such that modifications can be made following additional information and advice from consultees.