Appendix 11.3 Stage 1 Flood Risk Assessment

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1 Introduction

1.1 *Background*

1.1.1 Douglas West Extension Ltd is proposing to extend the consented Douglas West Wind Farm (hereafter referred to as the "Proposed Development"), at site centre British National Grid (BNG) NS 80399 32105. The Proposed Development site lies west of the M74 in rural South Lanarkshire, approximately 2.68 km to the north-west of the village of Douglas, and approximately 1.56 km to the south of Coalburn to the nearest turbine

1.1.2 An Environmental Impact Assessment (EIA) Report has been prepared in support of an application submitted to the Scottish Ministers under Section 36 of the Electricity Act 1989, seeking permission to construct and operate the Proposed Development.

1.1.3 The purpose of this report is to identify and quantify any potential flooding issues associated with the Proposed Development. This report will take into account the recommendations of Scottish Planning Policy (SPP) issued by the Scottish Government in June 2014, Planning Advice Note (PAN) 61 Planning and Sustainable Urban Drainage Systems and PAN 69 Planning and Building Standards Advice on Flooding issued by the Scottish Government in August 2004 which is now superseded by the Online Planning Advice on Flood Risk (updated June 2014).

1.2 *Policies and Guidance*

1.2.1 The following represent the key Scottish planning policies and guidance in relation to flooding:

- **National Planning Framework 3:** Provides the long-term spatial strategy for Scotland's development.
- **Scottish Planning Policy (SPP):** Scottish Government's policy on nationally important land use planning matters. Provides policy on flooding and drainage (paragraphs 254-268).
- **Planning Advice Note (PAN) 61 – Planning and Sustainable Urban Drainage Systems:** Good practice advice for planners and the development industry complementing the Sustainable Urban Drainage Systems Design Manual for Scotland and Northern Ireland.
- **PAN 69 – Planning and Buildings Standards Advice on Flooding:** Scottish Government advice on planning and building standards in areas where there is a risk of flooding.
- **PAN 79 – Water and Drainage:** PAN 79 clarifies the role of the planning authority in setting the direction of development to inform the planning and delivery of new water infrastructure in a co-ordinated way. It explains the roles of Scottish Water and SEPA and encourages joint working in order to ensure a common understanding of capacity constraints and agreement on the means of their removal.
- **SEPA Guidance Note 8 - SEPA standing advice for planning authorities and developers on development management consultations:** Outlines methodologies that may be appropriate for hydrological and hydraulic modelling and what information SEPA requires to be submitted as part of a Flood Risk Assessment.
- **SEPA Technical flood risk guidance for stakeholders:** Outlines methodologies that may be appropriate for hydrological and hydraulic modelling and what information SEPA requires to be submitted as part of a Flood Risk Assessment.

- **Clyde and Loch Lomond LFRMP (2016):** Describes the actions which will make a difference to managing the risk of flooding and recovering from any future flood events, setting out the Local Plan District wide actions together with other flood risk management activities. The plan provides information on the funding and co-ordination arrangements for the delivery of actions set out in the Plan and confirms the commitment to use natural features to manage flood risk where beneficial.
- **CIRIA C624 – Development and Flood Risk – guidance for the construction industry:** Provides guidance to developers and the construction industry on the implementation of good practice in the assessment and management of flood risk as part of a sustainable development process.

2 Requirements of a Flood Risk Assessment (FRA)

2.1.1 Paragraph 255 of SPP notes that planning policy should promote:

- A precautionary approach to food risk from all sources;
- Flood avoidance;
- Flood reduction; and
- Promoting the use of Sustainable Drainage Systems (SuDS).

2.1.2 The updated SEPA Policy 41 - Development at Risk of Flooding: Advice and Consultations (2016), provides guidance on requirements and protocol for undertaking flood risk assessments

2.1.3 The Technical Guidance notes that the purpose of an FRA is to '*predict and assess the probability of flooding from all sources for a particular site or area and should recommend mitigation measures, including maintenance. The four key risk receptors to consider are human healthy, economic activity, environment and cultural heritage*'. The scale, nature and location of a proposed development will inform the scope of the FRA required.

2.1.4 The Technical Guidance advises that the detail and technical complexity of an FRA will be proportionate to the scale and potential significance of the study but, in all cases, it should address or comply with the following basic requirements, where relevant:

- the flood risk to the development itself;
- assessment of any mitigation measures proposed by the developer or planning authority;
- the impact upstream and downstream and to adjacent sites /existing development;
- any comments on any nearby hydraulic structures, including formal flood prevention measures;
- any comments on potential erosion related hazards;
- sustainability considerations such as climate change;
- any comments on habitats issues.

3 Site Information

3.1 *Site Location*

3.1.1 The site is located approximately 2.68 km north-west of Douglas and 1.56 km south of Coalburn (to the nearest proposed turbine) in rural South Lanarkshire.

3.2 *Site Description*

3.2.1 The Proposed Development will extend the consented Douglas West Wind Farm onto the adjoining eastern block of Cumberhead Forest to infill the remaining gap between Douglas West Wind Farm, Hagshaw Hill Wind Farm, and a number of other wind farms on the north side of the Douglas Valley.

3.2.2 The site area currently comprises commercial coniferous plantation. The surrounding land comprises rolling moorland to the north, east and south, with further forestry plantation to the west. A number of watercourses traverse the site including the Shiel Burn and tributaries of the Hagshaw Burn, the latter which forms the western boundary of the site. The Poniel Water flows just north of the site boundary. No residential properties lie within the site boundary.

3.2.3 The site comprises an area of approximately 372 hectares (ha) and gradually rises from 275 m Above Ordnance Datum (AOD) in the north to 465 m AOD in the south. The central grid reference for the site is NS 80399 32105. The site location and site boundary are shown in Appendix Figure 1.

3.3 *Proposed Development*

3.3.1 The Proposed Development will comprise 13 wind turbines of approximately 6 MW generating capacity each (meaning a total generation capacity of approximately 78 MW), plus around 20 MW of energy storage capacity. The associated infrastructure will include: site access; access tracks (new and re-used/upgraded); crane hardstandings; underground cabling; on-site substation, control room, energy storage facility and maintenance building; temporary construction compound (including concrete batching plant) and a laydown area; potential excavations/borrow workings; and two permanent meteorological masts.

3.3.2 The final Proposed Development layout is illustrated in Appendix Figure 2.

3.4 *Topography*

3.4.1 The elevation of the main site area (i.e. where all proposed turbines are to be sited) gradually rises from 275 m Above Ordnance Datum (AOD) in the north to 465 m AOD in the south. The proposed southern access route (an existing track) slopes downward from the main site area, to approximately 270 m AOD at its southern-most point. The proposed eastern access (the existing haul road) also slopes downward from the site, to approximately 195 m AOD.

3.5 *Climate*

3.5.1 The Drumalbin climate station is the nearest station to the Revised Development. Averages for temperature and rainfall at this station from 1981 to 2010 are represented in Table 1 below:

Table 1: Monthly temperature and rainfall averages for Drumalbin

Month	Max. temp (°C)	Min. temp (°C)	Rainfall (mm)
Jan	5.2	0.3	89.9
Feb	5.5	0.0	67.1
Mar	7.6	1.3	71.8
Apr	10.4	2.9	49.1
May	13.8	5.2	50.7
Jun	16.1	7.9	57.0
Jul	18.0	9.9	71.1
Aug	17.7	9.8	78.3
Sep	15.0	8.1	78.1
Oct	11.4	5.3	104.1
Nov	7.8	2.5	93.3
Dec	5.4	0.2	89.9
Annual	11.2	4.5	157.4

3.6 *Geology and Soils*

3.6.1 The site is underlain by sedimentary strata (sandstone, siltstone, mudstone) mainly of the Swanshaw Sandstone Formation, Kinnesswood Formation, Lawmuir Formation, and Glenbuck Group and Monks Water Group. The far northern site area is underlain by Lower Limestone Formation rocks. An igneous intrusion (microgabbro of the Mull Dyke Swarm) trends roughly north-east to south-west at the far western edge of the site.

3.6.2 Bedrock across most of the site area, including the proposed southern access track, is overlain by till, typically comprising stiff to hard clay with variable inclusions of sand, gravel and boulders.

3.6.3 There are three localised areas of peat shown on British Geological Survey (BGS) mapping at the west end of the site. Only one of these coincides with any proposed infrastructure (a short stretch of proposed access track), and peat depth surveys identified very little peat at the site, with no peat recorded along the proposed stretch of track where BGS mapping indicates peat to be present.

3.6.4 Soils across the central and southern parts of the site are classified as organic soils, peaty pozols and peaty gleys. Podzols are commonly found in coniferous woodland; water can percolate freely through the upper part of the profile. Gleys are termed as wet soils that have poor drainage.

3.7 *Hydrogeology*

3.7.1 The main site area is a moderately productive aquifer, in which flow is virtually all through fractures and other discontinuities. The far southern part of the site is identified as a low permeability aquifer, again with virtually all flow being through fractures and other discontinuities.

3.8 *Hydrology*

3.8.1 There are three main watercourses within the study area (1 km buffer around proposed new infrastructure):

- The Poniel Water flows roughly west to east to the north of the site, separating the on-site forestry from the former Dalquhandy Surface Mine to the north. On the north side of the Poniel Water are several ponds/lagoons formed from the historical mine workings.
- The Hagshaw Burn flows from south to north at the western edge of the site, draining into the Poniel Water to the north-west of the site.
- The Shiel Burn system comprises several tributaries rising in the southern part of the site and flowing northward, draining into a single watercourse (the Shiel Burn) which flows northward from the east-central site area to join the Poniel Water to the north of the site.

3.8.2 All site drainage is anticipated to flow to the Poniel Water, via the Hagshaw Burn or Shiel Burn system, or in the case of the far eastern site area, via the Longhill Burn (which drains to the Poniel Water to the north-east of the site). The Poniel Water flows into the River Clyde to the north-east of the site.

3.8.3 During site visits in January 2019, there was no indication of surface water flooding or issues with drainage in the Proposed Development area.

Water Crossings

3.8.4 Two of the proposed access tracks to turbines will require new watercourse crossings to be constructed, summarised below and illustrated on Appendix Figure 2.

- WC03: New crossing of an unnamed tributary of the Shiel Burn, east of T4. This is a small drainage ditch with limited catchment, flowing into the Shiel Burn approximately 225 m to the north. The proposed crossing would comprise a HDPE pipe (diameter to be confirmed), designed to maintain existing greenfield run off in the area.

- WC05: New crossing of the Shiel Burn, east of T9. This is a well-defined valley with grass treatment beds approximately 3 m high and 5 m wide. The proposed crossing would comprise a bottomless arch culvert, designed to provide sufficient capacity for the existing burn under the crossing.

3.8.5 Additionally, existing crossings of the Shiel Burn and tributaries will either be maintained (WC01 and WC02) or existing HDPE pipes will be replaced due to damage and/or concrete protection being required (WC04 and WC06).

3.8.6 Further information on the indicative water crossing designs is included in Appendix 11.2 to the EIA Report (Water Crossing Schedule). All final water crossing designs will be subject to authorisation under the CAR Licensing regime and detailed designs will be discussed and agreed with SEPA and SLC.

4 Flood Risk

4.1 *SEPA Flood Map*

4.1.1 The online SEPA flood risk map indicates essentially no flood risk at the site. There are a few localised points on the immediate banks of the Shiel Burn where the mapping indicates potential for limited surface water flooding. No wider surface water flood risk, and no fluvial flood risk, is identified within the site boundary.

4.1.2 The immediate banks of the Poniel Water to the north of the site are indicated to be at risk of fluvial flooding, with a slightly wider zone of flood risk around the Poniel Water further downstream (north-west). To ensure that these risks are not exacerbated, no site drainage from the Proposed Development will involve direct discharge to the Poniel Water; furthermore, drainage and water crossings will be designed to mimic greenfield conditions as outlined above.

4.2 *Risk of Fluvial Flooding*

4.2.1 All turbines have been located at least 50 m from all watercourses. In terms of the closest turbines to watercourses, T4 is approximately 75 m from a small tributary of the Shiel Burn. T9 and T10 are approximately 85 m and 95 m, respectively, from the Shiel Burn itself. All other turbines are at least 100 m from any watercourses.

4.2.2 The Shiel Burn is within a valley, and although it is not deeply incised near the proposed T9 and T10 locations, the watercourse is approximately 6 m and 4 m, below the level of those proposed turbines, respectively. The location of T4 is approximately 3 m to 6 m above the level of the nearby watercourses to the west and east of it, respectively. Given that SEPA flood risk mapping shows no risk of flooding of these watercourses, and taking account of the elevation of the proposed turbines, there is not considered to be a risk of flood waters impacting the turbines.

4.3 *Risk of Pluvial Flooding*

4.3.1 In terms of any anticipated risk of pluvial flooding the following points are noted. The only areas of surface water flood risk identified within the main site area are very small, localised points at/alongside watercourses. The proposed site infrastructure, including the turbines and the substation, control room and energy storage facility, are all located on areas of ground which are raised above or are remote from these areas.

4.4 *Flood Routing and Risk*

4.4.1 As noted above, it is considered that fluvial flood risk to the site is low, with flooding considered highly unlikely to affect any site infrastructure.

4.4.2 Drainage for the access tracks and hardstandings within the site will be designed to ensure that runoff from these does not adversely impact any of the site infrastructure or increase the risk of flooding downstream of the site. Water crossings will be designed to mimic greenfield conditions as outlined above.

5 Conclusions

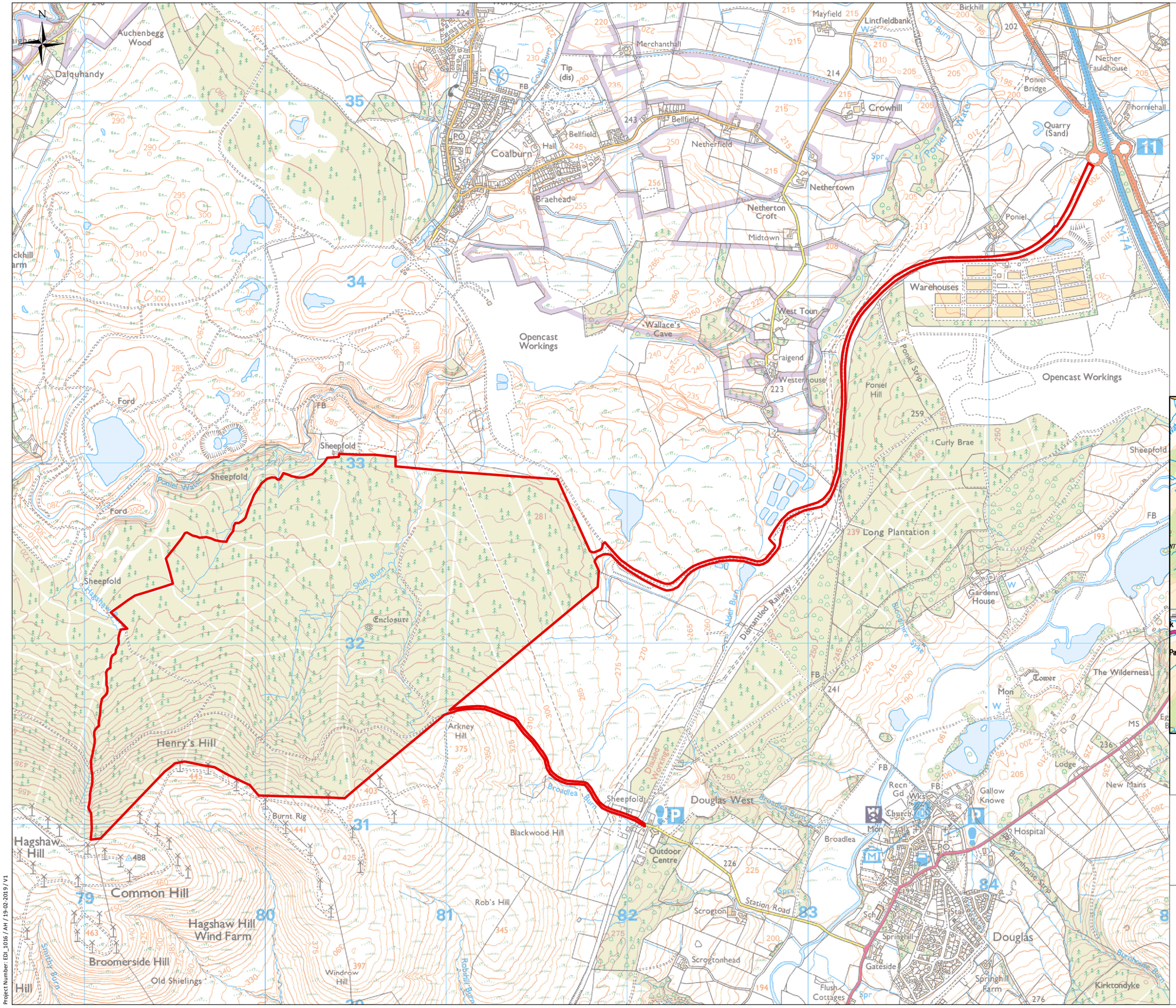
5.1.1 The risk of fluvial flooding impacting the Proposed Development is considered to be very low and therefore **not significant**.

5.1.2 The proposed site infrastructure is all located on areas of ground raised above and/or remote from the small and highly localised areas of potential pluvial flooding. As such, it is considered that the risk of pluvial flooding to the site is also low and therefore **not significant**.

5.1.3 Drainage for the access tracks and hardstandings within the site will be designed to ensure that runoff from these does not adversely impact any of the site infrastructure or increase the risk of flooding downstream of the site. Water crossings will be designed to mimic greenfield conditions.

6 References

- CIRIA (2004), Development and Flood Risk – guidance for the construction industry, London;
- Glasgow City Council (2016), Clyde and Loch Lomond Local Plan District - Local Flood Risk Management Plan June 2016;
- Scottish Environmental Protection Agency (SEPA),(2015), *Technical Flood Risk Guidance for Stakeholders;*
- Scottish Environmental Protection Agency (SEPA), (2016), SEPA Guidance Note 8 - SEPA standing advice for planning authorities and developers on development management consultations;
- Scottish Government (2014), Planning Advice Note (PAN) 61 - Planning and Sustainable Urban Drainage Systems;
- Scottish Government (2004), Planning Advice Note (PAN) 69 - Planning and Building Standards Advice on Flooding;
- Scottish Government (2004), Planning Advice Note (PAN) 79 – Water and Drainage;
- Scottish Government (2006, updated June 2014), *Online Planning Advice on Flood Risk*, Available at: http://www.gov.scot/Topics/Built-Environment/planning/Policy/Subject-Policies/natural-resilient-place/Flood-Drainage/Floodrisk-advice, Accessed: 29th June 2017.
- Scottish Government (2014), Scotland's Third National Planning Framework, Edinburgh;
- Scottish Government (2014), *Scottish Planning Policy*; Edinburgh;



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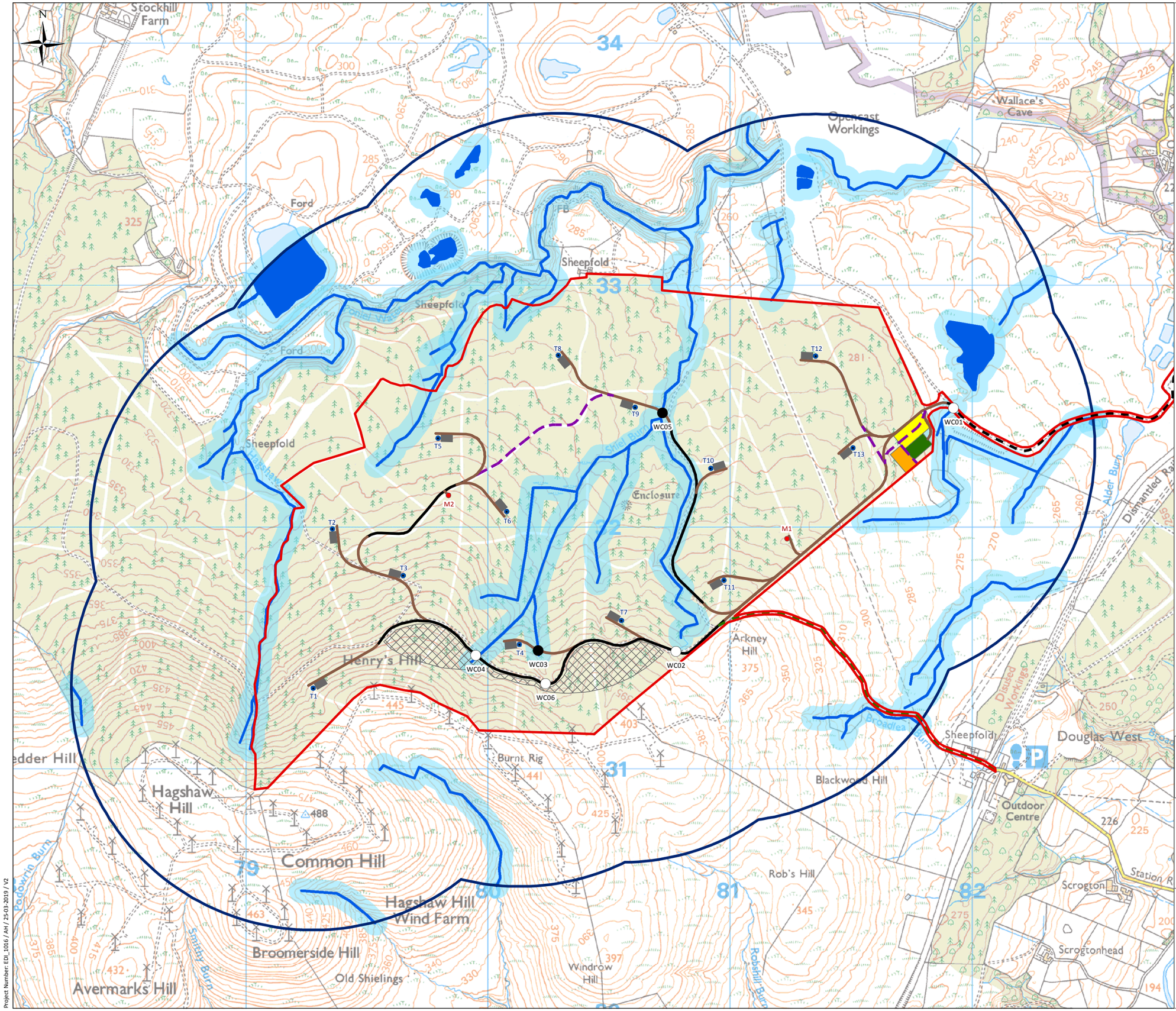
Douglas West Wind Farm Extension
Flood Risk Assessment

Figure 1

Site Location Plan



KEY

- Site Boundary
- T1 Turbine Location
- Hydrology Study Area
- Hardstanding
- Substation, Control Room & Energy Storage Facility
- Temporary Construction Compound & Concrete Batching Area
- Temporary Turbine Component Laydown Area
- Borrow Pit Search Area
- M1 Indicative New Met Mast Location
- WC01 Existing Water Crossing
- WC02 New Water Crossing
- Existing Access Road (Coal Road)
- Existing Timber Haul Road
- Indicative Access Track in Existing Tree Break
- Indicative New Access Track and Tree Felling Corridor
- Indicative New Temporary Access Track
- Watercourse
- Waterbody
- Watercourse/Waterbody 50m Buffer

NOTE
The Proposed Development infrastructure, in particular access tracks, has been drawn to reflect the true locations of forestry wayleaves on the ground rather than that shown on the Ordnance Survey base mapping.

0 0.35 0.7 km

Scale 1:15,000 @ A3

3R Energy CHP • Wind • Biomass

ITPENERGISED Earth. Smart. Solutions

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Figure 2

Site Layout, Watercourses and Water Bodies

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