4 DESCRIPTION OF THE PROPOSED PROJECT

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) describes the Proposed Project and its component parts which is the subject of two separate but inter-related proposed applications for planning permission. One planning application will be submitted to An Bord Pleanála ('the Board') seeking permission for the 110 kV infrastructure and associated works ('Substation and Grid Connection'), in accordance with Section 182A of the Planning & Development Act 2000, as amended as a deemed piece of Strategic Infrastructure Development ("SID") and the other associated planning application will be made to Kildare County Council under Section 34 of the same Act for the solar farm, battery storage compound and associated works (the 'Solar Farm'). The Proposed Project comprises:

I. the construction and operation of 2 areas of solar photovoltaic arrays mounted on metal frames over an area of approximately 200ha, and having a maximum overall height of 3 metres over ground level;
II. Internal solar farm underground cabling;
III. 2 no. temporary construction compounds;
IV. recreation and amenity works, including looped walk (upgrade of existing tracks and provision of new tracks, car parking and vehicular access);
V. 1 no. Battery Storage compound;
VI. 1 no. 110kV onsite Electrical substation with associated electrical plant, electrical equipment, welfare facilities, waste water holding tank and security fencing;
VII. 110 kV overhead Line grid connection cabling with associated angle lattice masts and supporting polesets;
VIII. Upgrade of existing tracks and provision of new site access roads;
IX. Site drainage;
X. Forestry Felling and Replanting;
XI. Permanent signage; and
XII. All associated site development and ancillary works

The Proposed Project will have an operational life of 35 years from the date of commissioning.

All elements of the Proposed Project, comprising both Substation and Grid Connection and the Solar Farm have been assessed as part of this EIAR.

4.2 Development Layout

The layout of the Proposed Project has been constraints-led, thereby avoiding the more environmentally sensitive parts of the site. The roads layout for the Proposed Project makes use of the existing onsite access roads and tracks where possible, with approximately 12 kilometres of existing roadway/ tracks requiring upgrading.

The recreational amenity proposals will require the placement of approximately 5 km of a 2.5m wide gravel walking track predominantly along a former machine track and the construction access track will be re-purposed to form part of the amenity walkway, in addition to being used for maintenance access during operation. A dedicated gated entrance and car parking area will also be provided for recreational use during the operational stage.

The overall layout of the Proposed Project is shown on Figure 4.1. This drawing shows the proposed locations of the solar arrays and all associated infrastructure, construction compounds, internal access tracks, battery storage compound, electricity substation and overhead grid connection. Detailed site layout drawings of the Proposed Project are included in Appendix 4-1 to this EIAR.

4.3 Solar Farm Development Components

The proposed Solar Farm development will include for a solar photovoltaic array and associated infrastructure, battery storage compound, inverters, access roads and parking, site compounds and security fencing, amenity trails and landscaping, peat and material storage areas (repositories), site drainage and all associated works. Descriptions of all Solar Farm elements are detailed below.

4.3.1 Grid Capacity

The export capacity for the Solar Farm is designed for approximately 70MW with a power factor (PF) equal to 0.95 (leading and lagging).

Assuming an export capacity of 70 MW, the Proposed Project has the potential to produce up to 92,450 MWh (megawatt hours) of electricity per year.

The 92,450 MWh of electricity produced by the Proposed Project would be sufficient to supply 22,012 Irish households with electricity per year, based on the average Irish household using 4.2 MWh of electricity (this latest figure is available from the March 2017 CER Review of Typical Consumption Figures Decision).

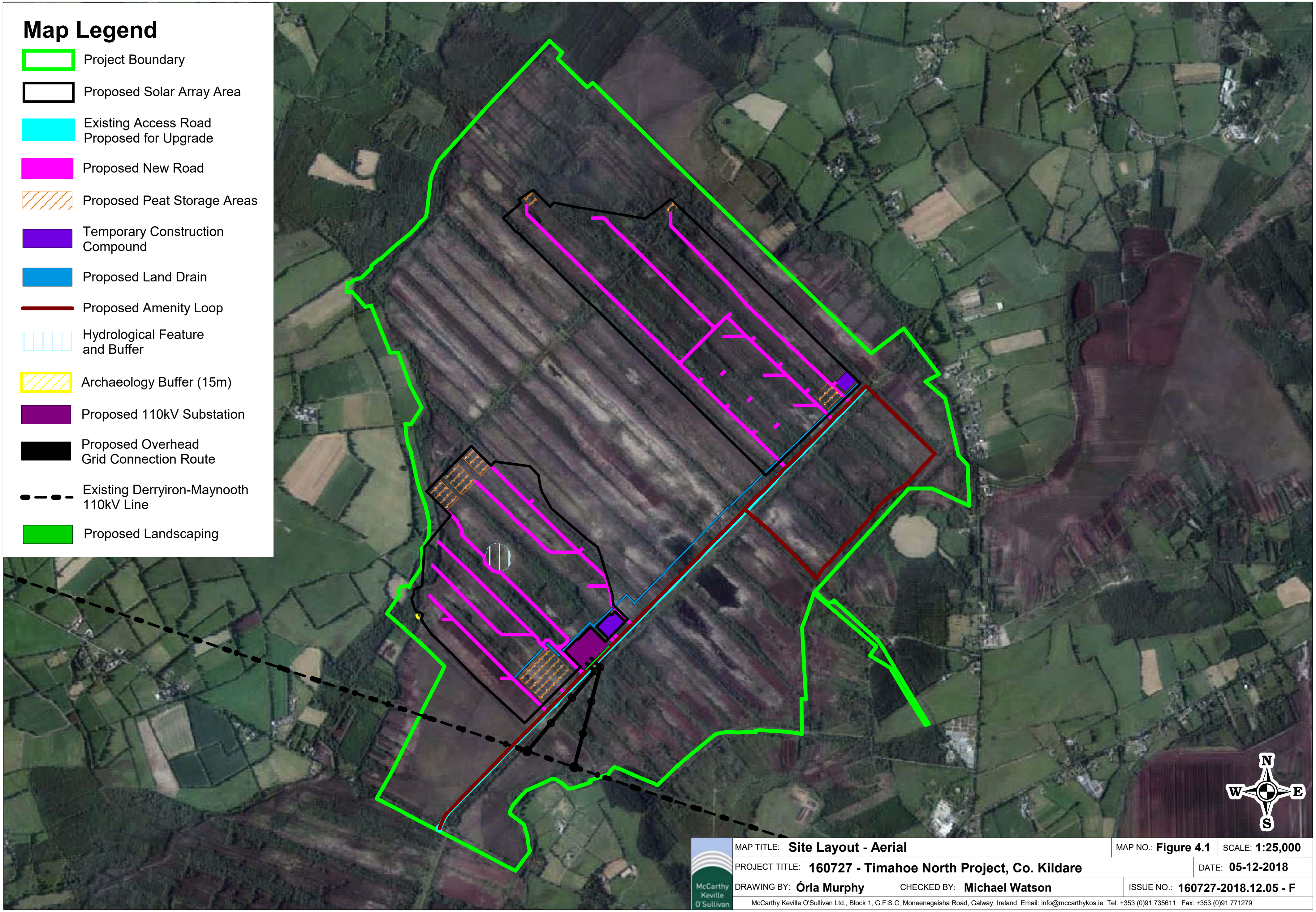
The 2016 Census of Ireland recorded a total of 73,596 households in Co. Kildare, including vacant houses. Per annum the Proposed Project would therefore produce sufficient electricity for the equivalent of 30% of all households in Co. Kildare.

4.3.2 Solar Arrays

ESB International have compiled a PV System Design Report for the project which is include in Appendix 3-1 and summarised below.

4.3.2.1 Solar PV System

Solar PV modules are combined to form solar panels as part of a PV system. A solar PV system consists of solar cells and other associated infrastructure listed in Plate 4.1 below.



MAP TITLE: **Site Layout - Aerial** | MAP NO.: **Figure 4.1** | SCALE: **1:25,000**

PROJECT TITLE: **160727 - Timahoe North Project, Co. Kildare** | DATE: **05-12-2018**

DRAWING BY: **Órla Murphy** | CHECKED BY: **Michael Watson** | ISSUE NO.: **160727-2018.12.05 - F**

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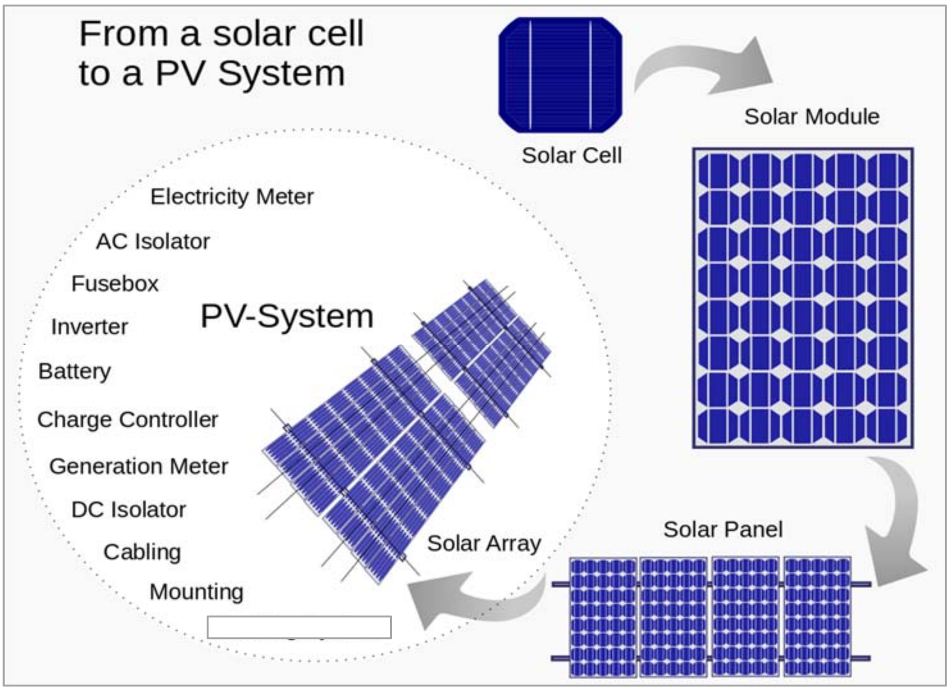


Plate 4.1 Solar PV components

4.3.2.1.1 PV Module Specification

As part of the assessment, various factors were considered before choosing the final PV module for planning as listed below. However, it should be noted that the final model used is flexible, and there are other possible alternatives.

- The PV module considered is a typical 60 cell polycrystalline PV module.
- The module considered has a 270 Wp capacity, which overall allows more flexibility for the final module layout design. During the final design, some areas might be excluded from construction and so some PV tables may be removed. In this case modules with a higher capacity would be considered.
- The system voltage of the PV module considered for Timahoe North is 1500 V. Recently this is becoming the standard voltage and it allows a lower Balance of System (BOS) cost.
- The most common PV module casing consists of an aluminium frame, glass in front and a synthetic material on the back. This is the type of casing that is proposed to be used for the proposed Solar Farm.

Prior to construction, new solar PV models or variants may be available that were not on the market at the pre-planning and EIAR preparation stage, which would better suit the Proposed Project site and fit within the proposed size envelope. Generally, the selection of the module size will be dependent on the EPC company that is ultimately procured to install the Solar Farm. Some EPCs prefer to use one specific module type because they have incorporated the use of this type of module in their construction methodology. Should this circumstance arise, the specific parameters of the alternative PV modules will comply with the criteria set out and considered in this EIAR, the relevant guidance in place at the time and any conditions that may be attached to any grant of planning permission that might issue.

4.3.2.1.2 PV Strings

The number of modules per string (string size) will be determined after the selection of the PV module model that will be used in construction; as certain specifications are needed from the module datasheet to calculate the maximum possible number of modules in the string. Generally, the aim is to have the maximum number of modules possible as the higher the total voltage of the string the lower the resistive losses.

As there is a 1500 V inverter planned for the proposed Solar Farm, the string maximum voltage is dictated by the maximum input voltage of the inverter. The total DC voltage of the string should never exceed this. The process to calculate the maximum number of modules per string involves a calculation of the maximum possible voltage of the module taking into account the environmental conditions of the area in which it will be installed.

For assessment purposes, the string length was calculated at 34 modules per string, allowing for some non-material variation in the final design.

4.3.2.1.3 PV Tables

The proposed location and scale of the solar panels within the Proposed Project site were chosen so as to maximise yield but also to reduce any potential impact on the surrounding environment. Further details are listed below:

- The PV tables at Timahoe North will face in a southerly direction, which is the optimal orientation regarding the energy production per installed capacity;
- Either a landscape or portrait arrangement was chosen for the Solar Farm site; appropriate gaps between modules will be implemented so as to minimise the number of tables required and reduce inter-row shading;
- A front to front distance (distance between the front side of the tables of one row and the front side of the tables of the next row) of 9m and a front to back distance (the space between the back side of the tables of one row and to the front side of the tables of the next row) of 5.1m was chosen for the PV spacing[1].
- The tilt angle used for the proposed solar arrays will be within 30 degrees; and
- The maximum height of all solar panels of up to 3m.

4.3.2.1.4 PV Table Length

Either a 4 Landscape or 6 Portrait table will be used within the Solar Farm development. Further detail on both tables are noted in Appendix 3-1.

In the event that EPCs suggest dividing PV tables into two smaller tables; each string cable will run in two tables and a flexible duct will be required for protection of the part that is suspended between the two tables. In this case, potential dividing of PV tables will have no effect on the Solar Farm footprint assessed.

[1] It should be noted that for planning purposes, worst case for the row spacing is considered the denser arrangement (tables close together). The ranges shown in the planning drawing ''Section & Elevation-PV Table'' cover many options including a dense table arrangement.

4.3.2.1.5 Ground Mounted System and Piled Foundations

As part of the proposed Solar Farm development, there will be up to 400,000 solar panels installed and mounted on fixed frames within the solar array area shown on Figure 4.1. An example of a ground mounted system is shown below in Plate 4.2.

Plate 4.2 Example of a Ground Mounted solar PV array

As part of the construction process, piling will occur before installation of the ground mounted system. According to site investigations and historical records, peat depths of 0.3m up to 4.5m have been recorded on site. The lightweight solar panel frames will be supported by mini piled foundations to a depth to achieve suitable bearing capacity below the peat layer for the forces calculated on the foundations.

Tracked dumpers and tracked trailers will be used to transfer materials around the Proposed Project site. Further information on piling construction is located in Appendix 4-3– Construction Methodology.

Once piling is completed, the ground mounted frames will be installed, and the PV panels will be bolted on top of the frames to hold them securely in place. The frames will also act as a casing for required connections to DC cables.

The contractor may adopt a "Just in Time" system of delivery to site with a number of HGV deliveries of frames and panels or an early delivery system with storage of components on site until required.

4.3.2.2 Inverters

An inverter is used in PV systems to convert direct current (DC) power from batteries or PV arrays into alternating current (AC) power. With large scale projects, like that at

Timahoe North, it is normal to make use of either centralised or decentralised inverters. For the proposed Solar Farm site, a centralised inverter has been chosen. A description of each type of inverter that was considered is described in Appendix 3-1 PV System Design Report.

For the proposed Solar Farm, the centralised electrical inverter unit, is a single inverter which serves the entire PV system, connected to the modules by several strings. These inverters come encased in a standard 20 ft or 40 ft (or other size) container. The inverter, the transformer and HV switchgear are included in the container.

The centralised electrical inverter stations may be prefabricated and delivered to site as single items or alternatively delivered separately and configured onsite. A piled foundation solution may be used to minimise the excavation of peat. A concrete or steel platform will then be formed for the components of the inverters to be assembled on.

4.3.3 Temporary Compound Areas

A suitably surfaced contractor's main southern compound and laydown area, measuring approximately 11,000 square metres in area, will be provided for the duration of the site works. It is proposed for the western section of the site of the Proposed Project, adjacent to the proposed substation and is shown in Figure 4.2.

The construction compound will consist of temporary site offices, equipment storage and construction staff welfare facilities, as well as car parking areas for staff and visitors.

Due to the overall scale of the Proposed Project, a temporary northern compound area will be constructed on the north east area of the site but will only be used for storage of construction material until it is fixed in place. This compound will be covered over with peat/soil and allowed to revegetate after the northern area of the Proposed Project site is complete and solar panels will then be constructed over the area.

The location and layout of both construction compound areas is shown on the Proposed Project site layout drawing in Figure 4.1.

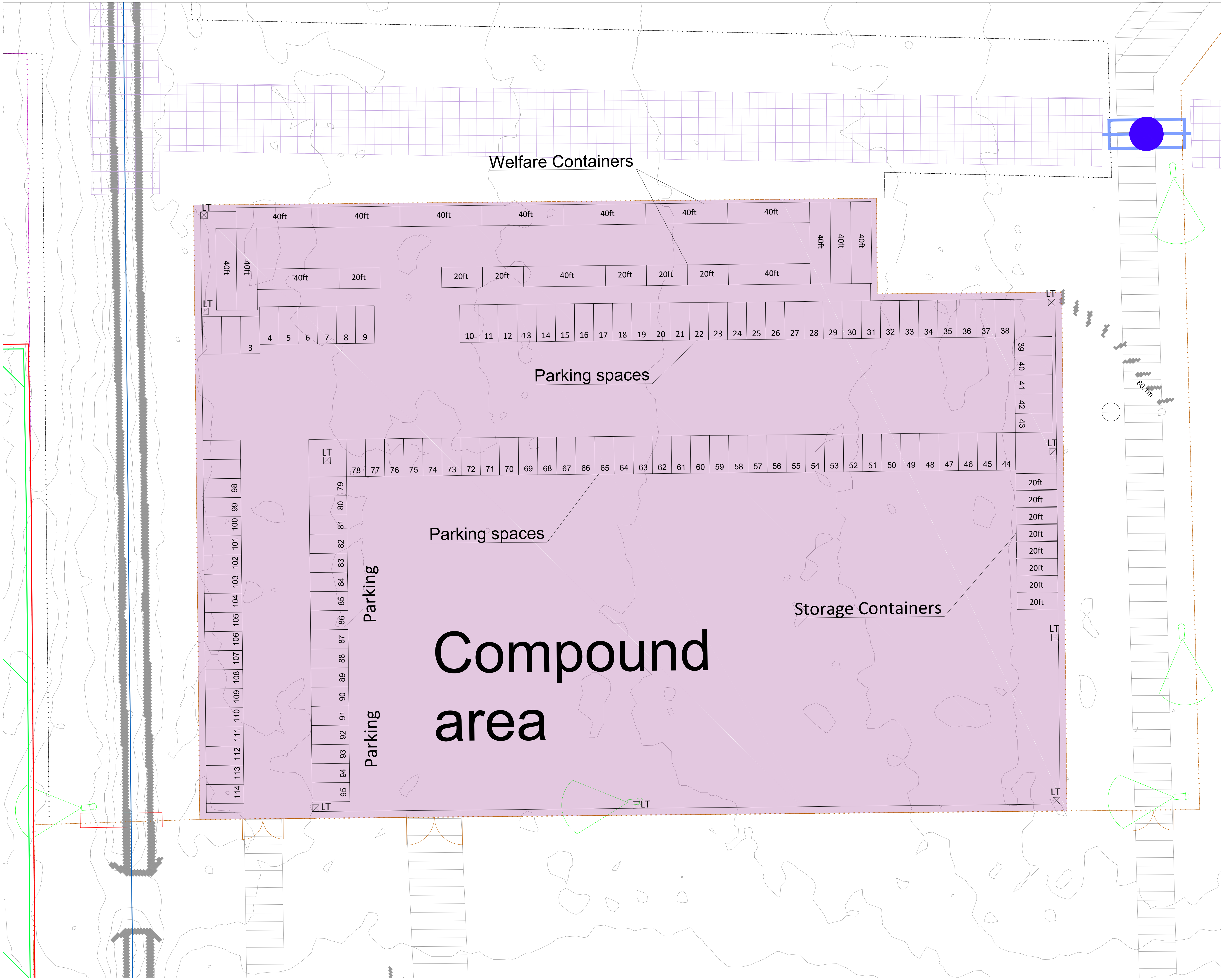
Portable cabin structures will be used to provide temporary site offices. These will be managed and serviced on a weekly basis or more frequently if required, and will be removed from the Proposed Project site on completion of the construction phase.

Container storage units will be provided for holding tools and materials. The compound will be fenced with chain-link fencing on wooden posts and will have a lockable gate.

A potable water supply will be provided by a water tanker or by means of a borehole.

Foul sewage from the temporary facilities will be routed to covered watertight tanks designed for receiving and storing sewage with no outlet. The tanks will be sized to suit the expected use and will be installed in a location remote from watercourses. Contents and residues will be regularly emptied by a competent operator for safe disposal to an approved treatment works. With high water tables the tanks will be calculated at design stage to omit the buoyancy risk.

The contractor may provide temporary storage and sanitary facilities at inverter hardstands and other construction areas during the construction period.



Drawing Notes

All dimensions are in meters, unless noted otherwise.

All dimensions to be checked on site and any discrepancy to be reported to the engineer.

Panel angle, orientation and location may be subject to change depending on the final design, PV panel & system manufacturer in order to maximize the efficiency of the installation. The number and location of invertors and other electrical equipment may also be subject to change.

Final position of CCTV stands to be decided at construction stage.

Drains which encroach on panel layout to be culverted.

Drawing Legend

- KCC Application Boundary
- EXISTING DRAINS
- PV TABLE
- EXISTING ACCESS ROAD TO BE UPGRADED
- NEW ACCESS ROADS
- BRIDGE OVER DRAIN WITH ACCESS ROAD
- INVERTER STATION WITH PAD AND LABELING (PAD SIZE: 25m x 25m)
- DEER FENCE (PROJECT BOUNDARIES)
- BRIDGING STRUCTURE OVER DRAIN FOR THE DEER FENCE CROSSING
- ACCESS GATES
- SHEEP FENCE (AROUND DRAINS)
- SUBSTATION FENCE
- CONCRETE DRAINAGE CULVERT
- MAIN COMPOUND AREA
- CCTV CAMERA
- SWITCHBOARD (NORTH SIDE)
- 20ft CONTAINER (WELFARE OR STORAGE)
- 40ft CONTAINER (WELFARE OR STORAGE)
- NEW DRAIN
- U-TURN AREAS (THREE TYPES)

DRAWING TITLE: **Compound Area**	
PROJECT TITLE: **Timahoe North Project, Co. Kildare**	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Jimmy Green**
PROJECT No.: **160727**	DRAWING No.: **Figure 4.2**
SCALE: **1:500 @ A3**	DATE: **12.12.2018**
OS SHEET No.: **3187, 3188, 3253, 3254**	

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Portable generators will also be provided to facilitate commissioning of the Proposed Project site.

4.3.4 Internal Solar Farm Underground Cabling

The solar panels within their rows will be connected by cabling. The PV arrays would then be connected together by DC cables buried in ca. 700 mm deep trenches before connecting to the inverter units.

All cable trenches will be excavated by wide track bog master type excavators, but where possible, track type trenchers will be used to minimise peat excavation. Peat from excavations may be side casted and profiled locally where feasible and then will be used to backfill trenches were possible. Any excess peat will be levelled in lower contour areas or transported to the closest on-site peat repository.

Beyond the centralised electrical stations, AC internal collector cable systems will be required, and these will be placed in trenches approximately 800 mm deep and where possible will be located along the access track to minimise trenching through the solar panel areas. The cables along the track will be laid in ducting or direct buried in trenches in the original peat ground and over filled with sand and marker tapes to the cable designer's specification and the excavated peat backfilled to ground level. This will be done by a wide track excavator.

Where ground conditions allow, the internal collector cable system will be directly buried along designated routes from the inverter units back to the substation. In areas of deep peat and localised ground condition variations there may be a requirement to stabilise cables using a rafting or wrapping detail which will be developed by the installation contractor during the detailed design and installation.

Where appropriate, the vegetation and top 150 mm of soil will be stripped and laid beside the trench and used to reinstate to original ground level immediately after the cables have been installed.

The crossing of streams and rivers will be carried out by open trench method or trenchless methods. The single stream within the Proposed Project is the Mulgeeth stream. The open trench method of crossing streams and rivers can be carried out by "damming and fluming" method or "damming and pumping" method. The method adopted at particular locations will be implemented only with the approval of Inland Fisheries Ireland (IFI). The construction will take place outside the salmon spawning period from October to April unless otherwise agreed with IFI locally.

All cable trenches will be developed, and ducting installed to Eirgrid/ESB specifications.

4.3.5 Battery Storage Compound

A Battery storage compound is proposed to be located adjacent to the substation. This compound is proposed to include 10 No. battery modules contained within steel units with dimensions of approximately 13.7 m x 2.4 m x 2.8 m high. The enclosures will be similar in appearance to standard shipping containers and shall be placed on concrete foundations.

The system proposed includes lithium-ion batteries, connected to inverters that convert direct current (DC) to alternating current (AC), which are in turn connected to step up/down MV/LV (medium voltage/low voltage) unit transformers feeding a common busbar located in the Independent Power Producer's (IPP) control building within the substation. Depending on the size and type of the transformers they may be bunded with drainage via an oil interceptor unit.

Detailed design of the Plant will be carried out following selection/ confirmation of the battery supplier.

The drawings included with this application show details of the bunding and drainage which will be installed, should they be required.

4.3.6 Site Amenity Proposals

4.3.6.1 Introduction

The Proposed Project and all its associated infrastructure creates a unique opportunity to develop an amenity area for use by members of the local and wider community alike. The peatland habitat at Timahoe North is attractive to both locals and visitors to the area because of its history and variety of vegetation. Parts of the site of the Proposed Project will be developed and promoted for walking activities. This proposal is based on the current use of the area as an informal walking route; where the proposed amenity facilities will allow for an upgrade of the current track and allow the site to be more openly available to walkers, trail runners and other recreational users, as outlined below.

4.3.6.2 Amenity Facilities

The proposed amenity facilities consist of a loop walk, complimented by waypoint signage, and visitor facilities in the form of a car park each of which are detailed in the below. The following proposals should be read in conjunction with Figure 4.3 which maps the proposed recreation and amenity proposals for the site of the Proposed Project.

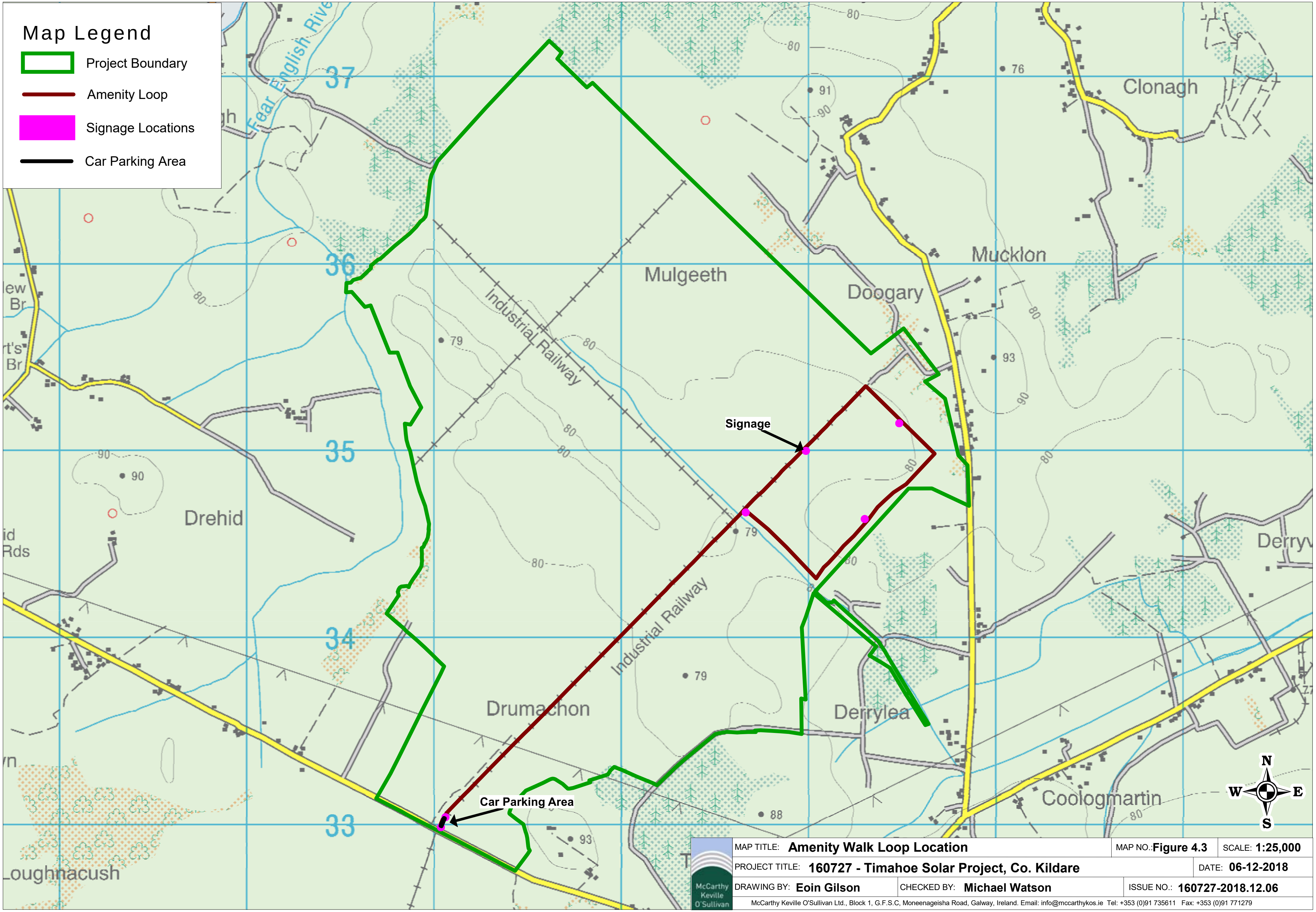
4.3.6.3 Amenity Area Entrance and Carpark

Access to the amenity area and walkway will be via the Derrymahon Road in the townland of Timahoe East, making use of the existing entrance, as shown on Figure 4.1 and in Appendix 4-2. During the construction of the Proposed Project, the public will not be allowed access to the site and will be able to gain access once the amenity walkway is operational. This existing entrance and track will be upgraded to ensure adequate visibility splays and safe access and egress for passenger vehicles or cyclists.

A timber control gate will be erected adjacent to the parking area allowing access to the Proposed Project site, and a timber post and rail fence will be erected around the car park and amenity loop entrance. This detail is shown in Appendix 4-2. This entrance will be used during construction of the Proposed Project, prior to the operation of the amenity loop, and will be used to provide access for maintenance staff and vehicles during the operational phase of the Proposed Project.

A visitor car park will be constructed on the southwestern side of the amenity access track adjacent to the site entrance, the detail of which is shown in Figure 4.3. The surface dressing of this car park will be level and compacted Clause 804 stone and would accommodate up to 18 vehicles.

The car park would act as a landing point for recreation and amenity users arriving at the Proposed Project site. The car park would provide a safe and easily accessible landing point, allowing visitors to orientate themselves on Proposed Project site from this location.



Ordnance Survey Ireland Licence No. AR 0021815 © Ordnance Survey Ireland/Government of Ireland

4.3.6.4 Amenity Walkway

It is proposed to upgrade and repurpose the construction access track and make use of an old peat extraction related machine pass, to lay the walking track on for walkers, trail runners and general outdoor recreation. The looped walk will measure approximately 5.24 km of a 2.5m wide gravel walking track predominantly along the former machine track and the construction access track will be re-purposed to form part of the amenity walkway, in addition to being used for maintenance access during operation. The rest of the amenity loop will be upgraded using the same approach outlined in Section 4.5.1.1 below. The amenity trail will correspond to National Trails Office Class 3 Walking Trails standard, or better.

The proposed walkway is shown on Figure 4.3 and a cross sectional drawing is shown in Appendix 4-2.

4.3.6.5 Waypoint Signage

Three different forms of information and waypoint signage will be provided across the proposed recreation and amenity area. The proposed locations of the signage are indicated on Figure 4.4.

Entry Point signage will be provided at both the entrance to the Proposed Project site and at the beginning of the looped walk, so as to direct recreation users around the site. The entry point information boards will clearly indicate the marked trail on a map, as well as outlining the distance, suitability and length of the trail to the user. The signage will also indicate the principles of 'Leave No Trace'. Waypoint map information signage indicating the location of the sign in the context of the overall site will be provided at various locations across the Proposed Project site, which will indicate to users "You Are Here" and outline the options available to them for continuing through the recreation area. Waypoint direction signage will be provided at all junctions or at least at every one kilometre along the trails as reassurance waymarkers, to indicate the recommended direction of travel and distance to trail end and return distance to trailhead. Elevation drawings of the proposed typical signage are shown on Figure 4.4.

4.3.6.6 Access

Amenity access will be via the Derrymahon Road. The Derrymahon Road, in turn, provides access to the R402 to the west leading to nearby Johnstownbridge, Enfield, Edenderry and Carbury. The Derrymahon Road also allows access to the eastern settlements of Prosperous, Naas and Maynooth. The vehicular access will be gated, and access will be managed by local key holders.

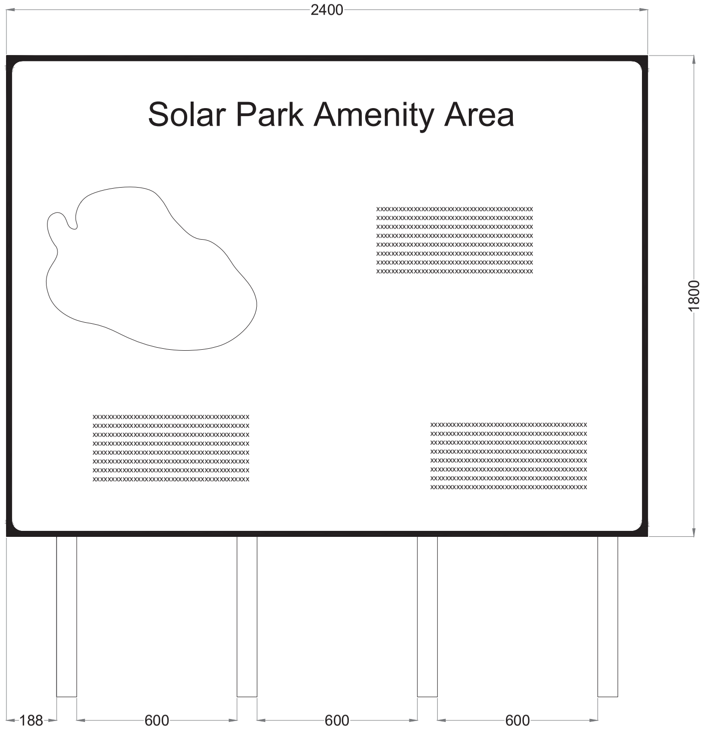
4.4 Substation and Grid Connection Development Components

4.4.1 Onsite Electricity Substation

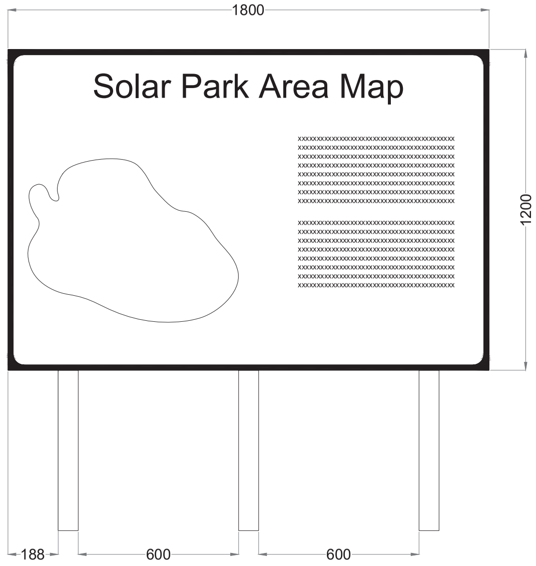
It is proposed to construct a 110 kV substation and associated grid connection within the site of the Proposed Project as shown in Figure 4.1. It is proposed to connect from the substation to the Derryiron-Maynooth 110 kV line, which traverses the southern section of the Proposed Project site.

The proposed substation will be located within an area of peatland which will be excavated prior to construction. It is surrounded by forestry on all aspects, which will screen it from view from the R402 Regional Road, located approximately 3.75km northwest of the substation at its nearest point, and all other local roads surrounding the Proposed Project site. It is proposed that some localised landscaping will be required along the southern boundary of the substation to reduce visibility.

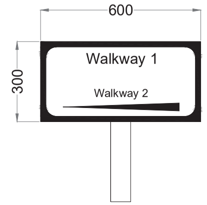
Note
For illustrative purposes only
exact details to be confirmed



Signage Type A - Waypoint Map Signage



Signage Type B - Entry Point Signage



Signage Type C - Way Point Direction Signage

DRAWING TITLE: **Amenity Area Signage**	
PROJECT TITLE: Timahoe North Project, Co. Kildare	
DRAWING BY: **Joseph O Brien**	CHECKED BY: **Michael Watson**
PROJECT No.: **160727**	DRAWING No.: **Figure 4.4**
SCALE: **1:20 @A3**	DATE: **04.12.2018**

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The footprint of the proposed onsite electricity substation compound measures approximately 21,390 square metres and will include a solar farm control building and the electrical components necessary to consolidate the electrical energy generated by the solar arrays. Further details regarding the connection of the onsite substation to the national electricity grid are provided in Section 4.4.3 below.

The layout of the proposed onsite substation is shown on Figure 4.5. The substation compound will include plinths to support electrical equipment including transformer, cable ducts, etc. and will be enclosed with security fencing on which warning, project description and interpretation signage will be attached.

The construction and exact layout of electrical equipment in the onsite electricity substation will be to Eirgrid/ESB networks specifications.

4.4.2 Substation Laydown Area

Excavated material in the area of the substation permanent hardstanding will consist of peat material. The material will be placed in peat deposition areas around the Proposed Project site. Some of the excavated material will be reused at the edges of the track with the remainder being stored in deposition areas.

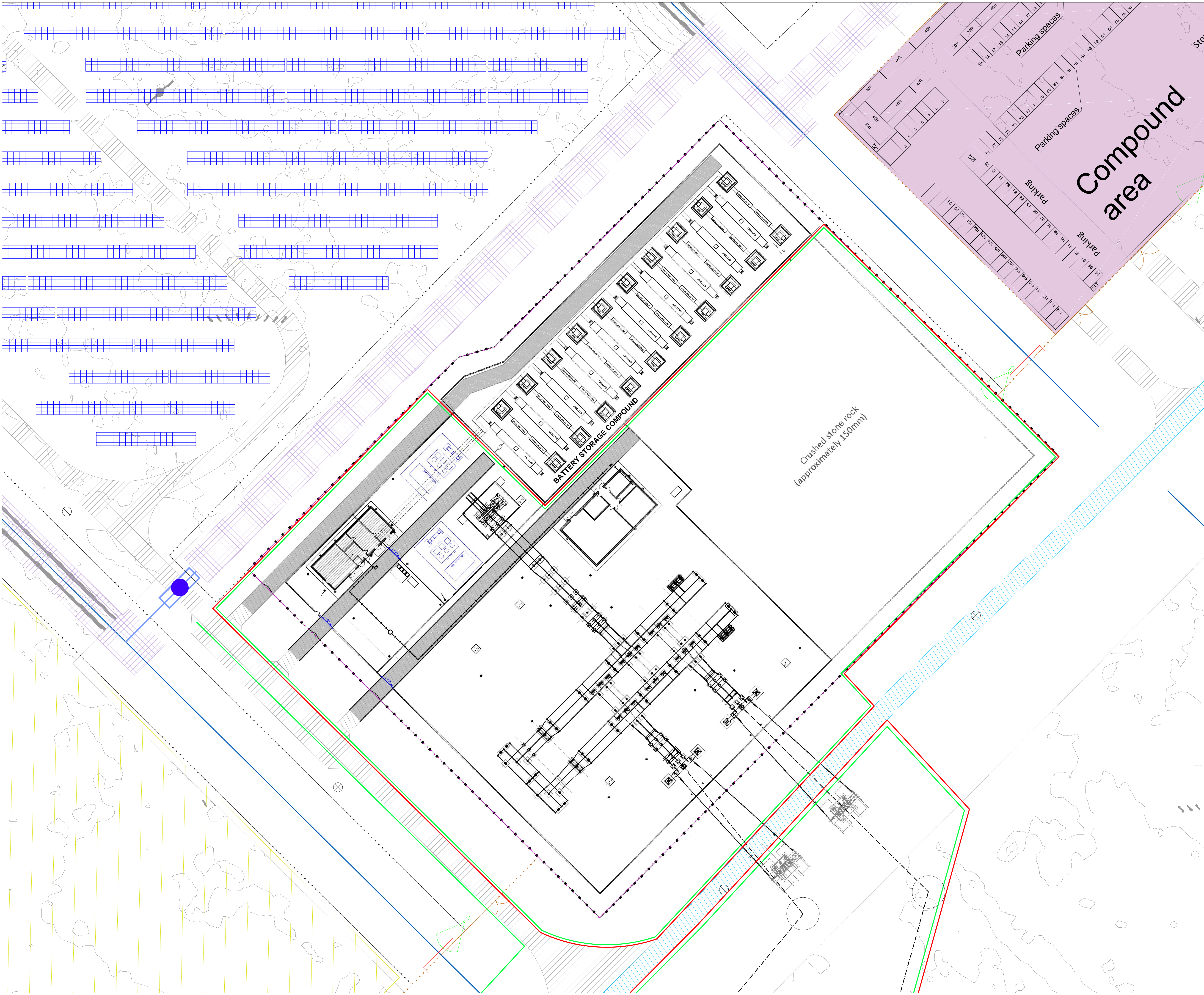
Based on the preliminary site investigation it is anticipated that piled foundations will be employed in the area of the substation. However, there is a possibility that shallow foundations may be employed in areas of the substation where the detailed site investigation reveals suitable bearing strata at shallow depth.

4.4.2.1 Solar Farm Control Buildings

There are two construction compounds location within the proposed substation. The TSO Switchgear building measures approximately 18 metres by 11 metres and is located in the centre of the substation building. Additionally, the IPP Switchgear building, measures approximately 17 metres by 7 metres and is be located in the western area of the substation. The control buildings will be single storey and will consist of a pitched roof supported on blockwork cavity walls on reinforced concrete strip footings. Hard finishes will be provided for the majority of floor areas throughout the building. These will provide durable surfaces that enhance the building environment and are easy to clean. External doors and escape doors will generally comprise metal flush doors and mild steel frames. Layout and elevation drawings of both control buildings are included in Appendix 4-1.

The Solar Farm control buildings will include staff welfare facilities for the staff that will work on site during the operational phase of the Proposed Project. Further information on the internal layout of the control buildings are included in Appendix 4-1.

It is proposed to manage wastewater from the staff welfare facilities in the control buildings by means of a sealed storage tank, with all wastewater being tankered off site by permitted waste collector to wastewater treatment plants. It is not proposed to treat wastewater on-site, and therefore the EPA's 2009 '*Code of Practice: Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤ 10)*' does not apply. Similarly, the EPA's 1999 manual on '*Treatment Systems for Small Communities, Business, Leisure Centres and Hotels*' also does not apply, as it too deals with scenarios where it is proposed to treat wastewater on-site.



Drawing Notes

All dimensions are in meters, unless noted otherwise.

All dimensions to be checked on site and any discrepancy to be reported to the engineer.

Panel angle, orientation and location may be subject to change depending on the final design, PV panel & system manufacturer in order to maximize the efficiency of the installation. The number and location of invertors and other electrical equipment may also be subject to change.

Final position of CCTV stands to be decided at construction stage.

Drains which encroach on panel layout to be culverted.

Drawing Legend

- KCC Application Boundary
- S182A Application Boundary

DRAWING TITLE:

Substation Plan

PROJECT TITLE:

Timahoe North Project, Co. Kildare

DRAWING BY: Joseph O Brien	CHECKED BY: Jimmy Green
PROJECT No.: 160727	DRAWING No.: Figure 4.5
SCALE: 1:1,000 @ A3	DATE: 12.12.2018
OS SHEET No.: 3187, 3188, 3253, 3254	

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Such a proposal for managing the wastewater arising on site has become standard practice, particularly in areas where finding the necessary percolation requirements for on-site treatment would be challenging. This method has been accepted by numerous Planning Authorities and An Bord Pleanála as an acceptable proposal.

The proposed wastewater storage tank will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. Full details of the proposed tank alarm system can be submitted to the Planning Authority in advance of any works commencing on-site. The wastewater storage tank alarm will be part of a continuous stream of data from the sites solar array and electricity substation that will be monitored remotely 24 hours a day, 7 days per week. Only waste collectors holding valid waste collection permits under the Waste Management (Collection Permit) Regulations, 2007(as amended), will be employed to transport wastewater away from the Proposed Project site. When the final destination of the materials is known following the appointment of a permitted contractor, this information can be submitted to the Planning Authority if necessary.

4.4.3 Grid Connection Cabling

The planning application for the Proposed Project includes permission for a 110kV grid connection cabling between the proposed substation and the national electricity grid so as to export the electricity generated, as shown in the Proposed Project layout drawings in Appendix 4-1. It is intended that the Proposed Project will connect to the national grid by an overhead cable via the existing Derryiron-Maynooth 110 kV line, located 500m south of the proposed Substation. This will require the construction of 4 No. angle masts at approximately 20-metre height (2 No. masts at the substation and 2 No. masts at the 110 kV line), which will be connected by two overhead lines supported by standard wooden polesets. The poles will measure approximately 18m in height and be spaced approximately every 200 metres.

The approximate distance from the proposed substation location to the 110 kV line is 750 metres.

The construction techniques carried out will be in line with international best practice and fully comply with all health and safety requirements.

The general alignment of the overhead grid connection cabling routes, assessed as part of this EIAR, is presented in the layout drawings in Appendix 4-1. The proposed cable construction methodology is described in Section 4.9.5 below.

The exact final detail and specifications of the grid connection route for the Proposed Project will ultimately be decided by ESB/EirGrid.

4.5 Project Development Components

4.5.1 Site Tracks

To provide access within the site of the Proposed Project, existing tracks will need to be upgraded and new access roads will need to be constructed. The access track network required throughout the Proposed Project site to facilitate construction of the Solar Farm and Substation and Grid Connection will extend to approximately 3.5km of main access tracks, approximately 12 km of spur tracks as well as an additional amenity track of approximately 2km.

Crossings of drains and minor watercourses will be by culverts. These will be suitably designed for base flows and peak flows, with a minimum size to avoid occurrence of blockages and build-up of discharges and to avoid increased flow velocities with the potential to cause erosion. The stream crossing will be designed in accordance with the requirements of IFI's Requirements for the Protection of Fisheries Habitats during Construction and Development works at River Sites.

4.5.1.1 Upgrade of Existing Access Roads or Tracks

Access to the Proposed Project site is via an existing site entrance off the Derrymahon Road. The main access track will be an upgrade of an existing track, which runs east of the proposed substation element. The track will cater for both traffic during construction and operation as well as for amenity purposes.

It will extend to the middle of the Proposed Project site, adjacent to the substation area. The design of the scheme requires additional track to be constructed. It will be a permanent track to facilitate access to the electrical substation and inverters and also to access different parts of site for panel maintenance.

The proposed walking loop, as shown in Figure 4.3, will be formed from upgrading of the former machine track and of the existing informal track currently used by walkers.

Road Section drawings are located in Appendix 4-1.

4.5.1.2 Construction of New Floating Roads

Investigations across the Proposed Project site have determined that an adequate stretch of road formation can be achieved by floating of track on existing topography. It should be noted that these locations should be confirmed by the project designer at the detailed design stage.

Bord na Móna benefits from its unique experience of traversing bogs and the use of industrial machinery on bogs over many decades. As such, the tracks will generally be formed by placing a layer of geotextile membrane on the existing surface and road make up with coarse granular fill followed by a 100 mm layer of fine gravel. An average overall thickness of about 400 mm - 750 mm is envisaged.

A detailed stability analysis should be carried out by the designer where it is proposed to install floating access roads over the peat prior to any construction work commencing on site.

Floating roads minimise impact on the peat, particularly peat hydrology. As there is no excavation required no peat arisings are generated. However, where the underlying peat has insufficient bearing capacity or due to topographic restrictions an excavated type access road may be more suitable.

Road Section drawings are located in Appendix 4-1.

4.5.1.3 Construction of New Excavated Roads

All access roads through the solar array area will be new and will either be excavated or floated. Excavate and replace type access roads are the conventional method for construction of access roads on peatland sites and the preferred construction technique in shallow peat provided sufficient capacity is available on site for the excavated peat and in areas where topographical conditions restrict the use of floated roads.

In areas where the peat does not make the required CBR ratings for floating track, excavate and replace method will be used, where the peat material is excavated and rock up fill is used to fill up to road formation level. Excavated peat material will be transported to peat repositories for permanent storage and areas were levels are permissible peat will be side casted and revegetated to side of access tracks.

Road Section drawings are located in Appendix 4-1.

4.5.2 Fencing, gates and security cameras

During the construction phase, fencing and gates will be installed first for the safety of the workers and public with the permanent site entrance being designed to ensure that appropriate sightlines are provided. It will comprise of a double leaf security gate constructed of low visual impact fencing in a similar style to the security fence.
There will be several other gates to allow access to various parts of the Proposed Project site whilst preserving safety and security. These gates will be constructed of similar design to fencing to create low visual impact.

The fencing will be constructed using 2m high deer fencing around the area of the solar panels, with wildlife flaps inserted to allow animals to pass in and out of the Proposed Project site as shown in Plate 4.3 below. The substation will be fenced using palisade fencing.

A number of discreet security cameras, similar to that shown in Plate 4.4, will be mounted at various points around the Proposed Project site. There will be no requirement to light the Solar Farm over night as the security cameras will be infra-red sensitive. The camera will not point toward the external area of the Proposed Project site or towards any external landowners or dwellings.

Plate 4.3 – Deer fencing for perimeter fence

Plate 4.4 – CCTV camera

4.5.3 Tree Felling and Replanting

4.5.3.1 Tree Felling

As part of the Proposed Project, tree felling will be required within and around the development footprint to allow the construction of the solar array areas, the 110 kV substation, access roads and the other ancillary infrastructure. During the design process, the development layout was modified so as to incorporate some of the existing trees into the plan for wildlife, lower the visual aspect and wind breaks throughout the development. A band of approximately 25 m width of trees will be retained as part of the design along the proposed construction roadway to buffer the Solar Farm.

A landscaping program will be carried out to the east of the substation boundary along the proposed construction road. This program will utilise any remaining screening post the construction of the substation combined with the reuse of peat/soil to form a berm to a height of between 1 to 2m and augmented by landscaping proposals. The berm will be stabilised by either being allowed to revegetate through natural recolonization or will be planted with native species

The layout of the Proposed Project has been overlain on the felling plan for the site. A total of 45.61 hectares of forestry will be felled within and around the footprint of the Proposed Project. Figure 4.6 shows the extent of the area to be felled as part of the Proposed Project.

It is proposed that all tree felling will be completed as advanced works to allow for construction to occur on a cleared site. To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the *Forest Service Forestry and Water Quality Guidelines* (2000), and *Forest Harvesting and Environmental Guidelines* (2000).

Before any harvesting works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

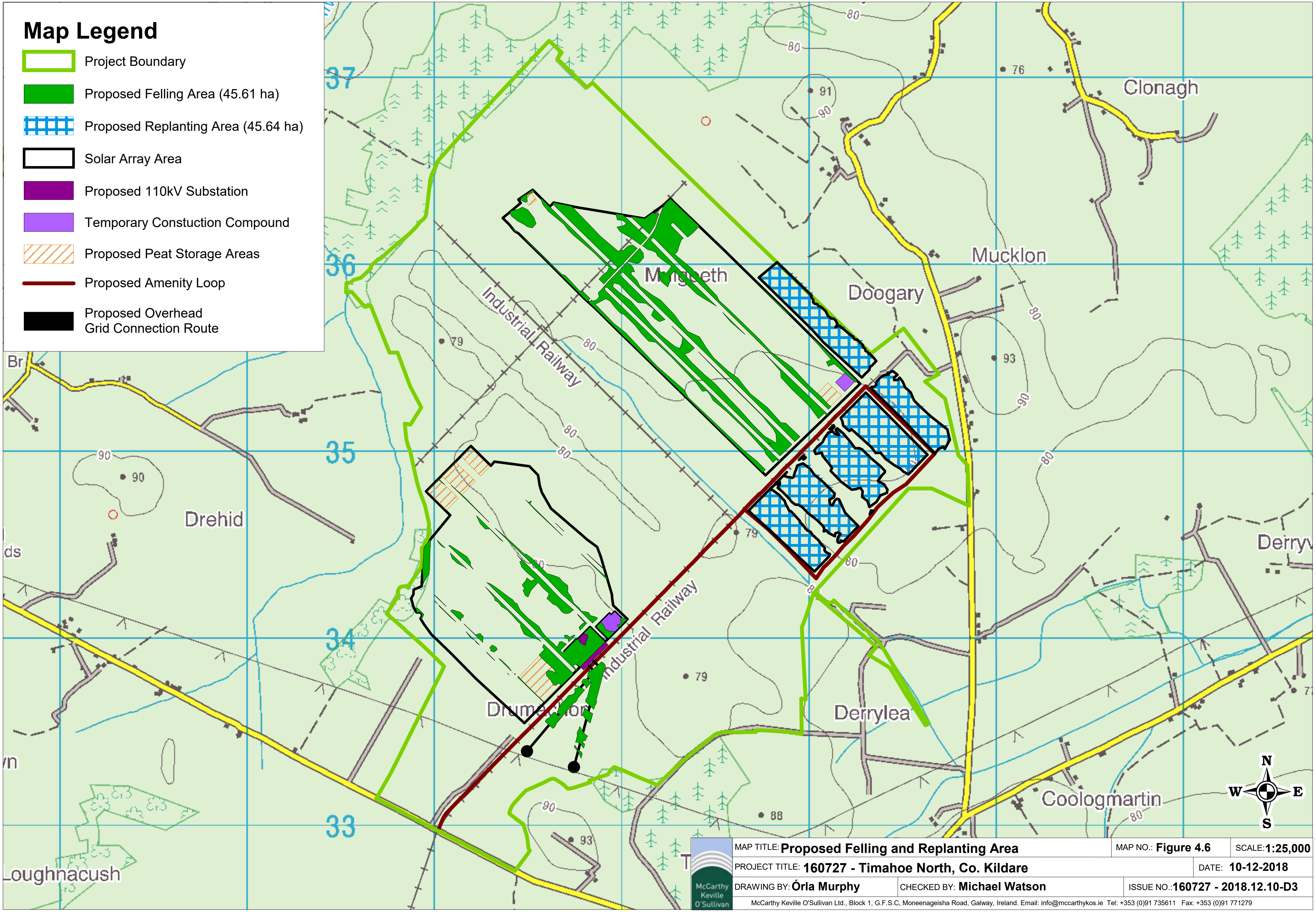
- The felling plan, surface water management, construction management, emergency plans and any contingency plans;
- Environmental issues relating to the Proposed Project site;
- The outer perimeter of all buffer and exclusion zones; and
- All health & safety issues relating to the Proposed Project site;

Across the Timahoe North site there are different maturity ranges of trees, with this taken into consideration the tree felling will come under three different categories:

- Mulching which will consist of track machine with a mulch head shredding the smaller trees with the mulch material being spread across the peat areas to assist the travelling across the sparsely vegetated peat areas
- Larger trees will be harvested and stock piled and used for other commercial use
- Over excavating will be completed in areas with light scrub to facilitate construction.

As noted in Chapter 1, Section 1.1.3, deforestation required for construction of the Proposed Project exceeds 10 hectares. The Proposed Project will require a felling application to the Minister for Agriculture, Food & the Marine.

The tree felling activities required as part of the Proposed Project will be the subject of a Felling Licence application to the Forest Service, under Section 17 of the Forestry Act 2017 and as per the Forest Service's policy on felling licenses. The policy requires that the area to be felled and proposed replanting areas be identified, as well as identifying the proposed new land-use of the felled site.


Map Legend
Project Boundary
Proposed Felling Area (45.61 ha)
Proposed Replanting Area (45.64 ha)
Solar Array Area
Proposed 110kV Substation
Temporary Constuction Compound
Proposed Peat Storage Areas
Proposed Amenity Loop
Proposed Overhead
Grid Connection Route
Clonagh
Mucklon
Doogary
Industrial Railway
Drehid
Derrylea
Coologmartin
Loughnacush
37
36
35
34
33
N
W
E
S
MAP TITLE: Proposed Felling and Replanting Area
MAP NO.: Figure 4.6
SCALE: 1:25,000
PROJECT TITLE: 160727 - Timahoe North, Co. Kildare
DATE: 10-12-2018
DRAWING BY: Órla Murphy
CHECKED BY: Michael Watson
ISSUE NO.: 160727 - 2018.12.10-D3
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4.5.3.2 Tree Planting

In line with the Forest Service's published policy on granting felling licences, areas cleared of forestry will have to be replaced by replanting an area of equivalent size at an alternative site. The Forest Service policy requires replanting on a hectare for hectare basis for the footprint of the proposed infrastructure.

The 45.61 hectares that will be felled for the construction of the solar array areas, the 110 kV substation, access roads and the other ancillary infrastructure will be replanted on a hectare for hectare basis. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that are under the control of the Forest service.

The replanting of the 45.64 hectares of forestry will take place within the Proposed Project boundary, both within the area proposed for the amenity walkway and an area east of the solar arrays as identified in Figure 4.6. The Solar Farm requires approximately 40.56 ha of replanting and the Substation and Grid Connection requires approximately 5.08 ha of replanting. Further assessment of the of the potential impacts of felling are provided in Chapter 6, Section 6.4 of this EIAR.

4.5.4 Peat Management Plan

4.5.4.1 Quantities

The quantity of peat requiring management on the Proposed Project site has been calculated by ESBi as part of the Peat Stability Risk Assessment in Appendix 7-1 of this EIAR.

The Timahoe North site is a cut over peat bog which has been out of commercial use for over 20 years. The Proposed Project site is mainly overlain with cut over bog. The depth of peat across the site varies from 0.05 m to 5.2m in certain local areas. The mean peat depths determined from 570 peat probes taken on site is ~1.9m. The peat risk has been minimised by optimising the design of the Solar Farm and will be further mitigated by choosing an acknowledged safe and controlled construction methodology, having a rigorous documentation and quality control system during construction and by controlling construction activities carefully.

Peat excavation for various components of the development is estimated to be 63,400m^3. 25,000m^3 of this will be from the proposed substation area.

In terms of peat handling and long-term storage, it is proposed to place excavated peat into 7 no. proposed peat repositories, and the total volume of these is 95,126m^3. Bord na Móna has considerable experience in this area (moving and storing peat), both during peat production operations and during the rehabilitation processes associated with its cutaway bogs. This experience has shown that the most environmentally sensitive and stable way of handling the movement of excavated peat, is its placement across the Proposed Project site and at locations as close as possible to the intended extraction/excavation areas. As such, the proposed peat repositories are distributed across the Proposed Project site, at suitable locations as close as possible to the main intended areas of excavation.

As detailed above, excavated peat material will only be moved short distances from the point of excavation and either be transported to peat repositories for storage or, where levels are permissible, peat will be side casted and revegetated to the side of access tracks. Both methods are further described below.

4.5.4.2 Placement of Peat & Material alongside Access Roads

In some areas of the site of the Proposed Project, it is possible and environmentally sustainable to place excavated materials close to the excavation areas, in particular along access tracks. During the excavation of the access tracks, where appropriate, the vegetation and top 150 mm of soil will be stripped and laid beside the trench and used to reinstate to original ground level immediately after the cables have been installed.

4.5.4.3 Peat and Material Storage in Peat Repositories

Where large excavations of peat occur, such as that within the area of the substation; peat will be stored within a number of peat repositories within the Proposed Project site as detailed above. The following general methodology will be employed in reinstating of repositories:

- Excavated materials that are surplus to backfill requirements and are deemed unsuitable for reuse in construction will be brought to the repository locations. This will include unsuitable materials generated during all construction stages;
- Excavators will level this material in suitable layers and compact it by tracking. Dead rolling may be carried out if the material is suitable. Volumes of materials generated during the access track, bases for inverters and hardstanding excavations will be stored in repositories. The peat material will be stored at approximately 1 m deep;
- Any mineral soils excavated during construction work will be stored separately in repositories within the Proposed Project site at a depth of approximately 1 m; and
- The previously stripped and separately stored peaty topsoil layer, which contains the remnant seed bank required for restoration, will be placed as the final reinstatement layer. Its fibrous nature will help to promote a stable surface once the vegetation establishes itself.

The method of reinstatement described above has been successfully applied at other renewable developments.

4.5.5 Site Activities

4.5.5.1 Environmental Management

All proposed activities on the site of the Proposed Project will be provided for in an environmental management plan. A Construction and Environmental Management Plan (CEMP) has been prepared for the Proposed Project and is included in Appendix 4-5 of this EIAR. The CEMP includes details of drainage, peat and overburden management and waste management. It is intended that the CEMP would be updated prior to the commencement of the development, to include all mitigation measures, conditions and or alterations to the EIAR and application documents that may emerge during the course of the planning process, and would be submitted to the Planning Authority for written approval.

4.5.5.2 Oils and Fuel

Oils and fuels will be used in plant and equipment during the construction phase.
Wherever possible, vehicles will be refuelled off-site. This will be the case for regular, road-going vehicles. However, for construction machinery that will be based on-site continuously, a limited amount of fuel will have to be stored on site in bunded areas. The following procedures will be implemented for on-site storage of fuels, lubricants and hydraulic fluids used on the construction site:

- Storage of fuels, lubricants and hydraulic fluids will occur mainly at the contractor's compound(s), which will be fenced and have a lockable gate, thereby ensuring that the area in which fuels, lubricants and hydraulic fluids are stored will be properly secured against unauthorised access or vandalism. Any fuels, lubricants or hydraulic fluids not stored in bunded tanks will be stored within bunded containers;
- The storage area within the compound will contain a small bund lined with an impermeable membrane in order to prevent any contamination of the surrounding soils and vegetation and of groundwater, the location of this area will be decided at construction stage;
- Selection of the location for storage of fuels, lubricants and hydraulic fluids will be based on the following:
  - It will be remote from surface drains and watercourses,
  - It will be readily visible for supervision and inspection,
  - It will be readily accessible for filling and maintenance, and
  - It will be protected against accidental impact.
- The bund will have capacity of at least 110% of the largest tank accommodated or 25% of the total maximum capacities of all tanks, whichever is the greater, where more than one tank is installed. They will be constructed and managed in accordance with the EPA Guideline, Bunding and Spill Management (2007); and,
- Outside the contractor's compound(s) there will be short-term storage of fuels in bunded tanks for diesel generators used on site.

The following procedures will be implemented during construction operations:

- Fuels and oils will be carefully handled to avoid spillages;
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and disposed of appropriately to only licensed and appropriately regulated bodies;
- Any waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or recycling as above;
- As a minimum, simple spill protection equipment that will be held locally will include specialist absorbent mats / pillows and granules for containment / clean-up of oil. Adequate quantities will be held in stock and be available for immediate use;
- Appropriate spill control equipment, such as oil soakage pads, will be available on site to deal with any accidental spillage and emergency response procedures will be put in place;
- Designated contractors' personnel will be trained and certified in oil spill control and clean up procedures and in the proper and safe disposal of any waste generated through such an event;
- All maintenance and servicing of mobile plant will take place in designated control areas to be decided at design stage.

4.5.5.3 Concrete Deliveries

Only ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. When concrete is delivered to site, only the chute of the delivery truck will be cleaned, using the smallest volume of water necessary, before leaving the site. Concrete trucks will be washed out fully at the batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a temporary lined impermeable containment area, or a Siltbuster-type concrete wash unit (http://www.siltbuster.com/sheets/RCW.pdf) or equivalent. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids can be disposed of off-site at an appropriate waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane. Two examples are shown in Plates 4.5 and 4.6 below.

Plate 4.5 Concrete washout area

Plate 4.6 Concrete washout area

The areas are generally covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents will be tankered off-site. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

Due to the volume of concrete required for the Proposed Project, in particular the construction of the substation and 110 kV steel tower foundations, and the requirement for the concrete pours to be continuous; deliveries are often carried out outside normal working hours in order to limit the traffic impact on other road users, particularly peak period school and work commuter traffic.

The risks of pollution arising from concrete deliveries will be further reduced by the following:

- Concrete trucks will not be washed out on the site but will be directed back to their batching plant for washout.
- Site roads will be constructed to a high standard to allow concrete trucks to be brought as close as possible to the excavation to pour directly into the excavation. In the event of this not being possible concrete shall be transported in dumpers. If the ground is very poor and wheel dumpers are not able to transport the concrete over the terrain, track dumpers will be used.
- The arrangements for concrete deliveries to the site will be discussed with suppliers before work starts, agreeing routes, prohibiting on-site washout and discussing emergency procedures.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.

4.5.5.4 Concrete Pouring

Because of the scale of the main concrete pours that will be required to construct the Proposed Project, the main pours are usually planned weeks in advance. Special procedures will be adopted in advance of and during all concrete pours to minimise the risk of pollution. These may include:

- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- During each pour the concrete shall be vibrated thoroughly using a vibrating poker.
- In the event that sheet piles have been used these are removed (pulled) at this stage.
- Restricting concrete pumps and machine buckets from slewing over watercourses while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- Ensuring that covers are available for freshly placed concrete to avoid the surface washing away in heavy rain.
- Disposing of surplus concrete after completion of a pour in agreed suitable locations away from any watercourse or sensitive habitats.

4.5.5.5 Vehicle Washing

A designated vehicle wheel wash area will be created adjacent to the main site entrance where all HGV's will be cleaned prior to leaving the site as deemed necessary.

The wheel wash will be a proprietary wheel wash approved by the Resident Site Engineer. Wash water will not be allowed to enter local watercourses and will enter a dedicated lagoon where any accumulated resultant sludge will be removed from site by a fully licenced contractor holding relevant waste collection and disposal permits.

4.6 Access and Transportation

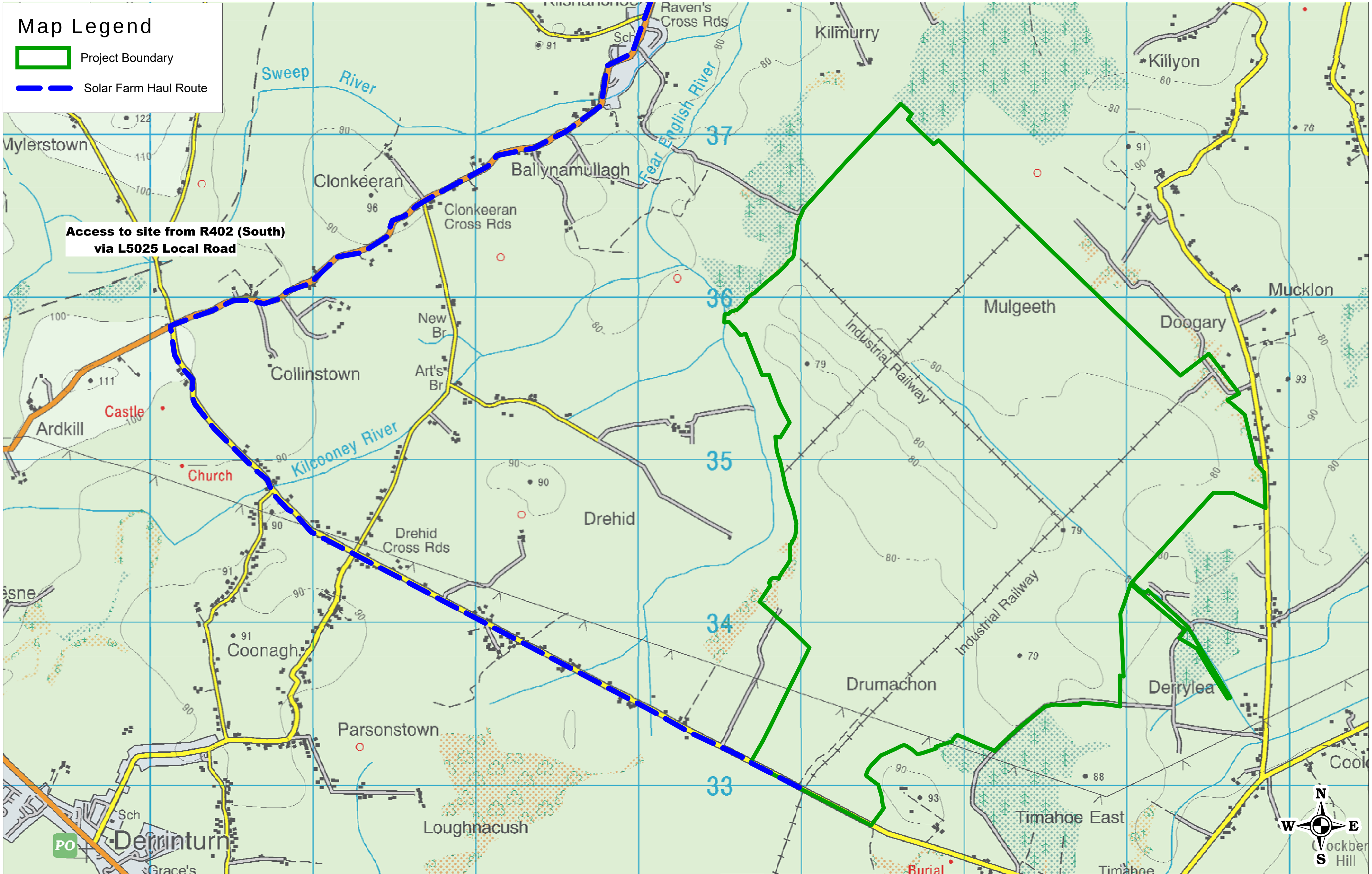
4.6.1 Site Entrance

It is proposed to access the site of the Proposed Project via the R402 Regional Road and along the Derrymahon Local Road in the townland of Timahoe East. An existing site entrance will be used to access the Proposed Project site. The access is sufficient so as to facilitate delivery of all construction materials and components. The entrance will be improved to define its location with a timber and post fence and improve its surfacing with a gravel finish.

The access is sufficient so as to facilitate delivery of all construction materials and components, as shown in Figure 13.1.10 of Chapter 13 Material Assets. Appropriate sightlines will be established to the east and west of the proposed site entrance for the safe egress of traffic. The proposed site entrance will also function as the entrance during the operational phase. The Proposed Project site entrance location is shown in Figure 4.1 and included in the detailed layout drawings in Appendix 4-1.

4.6.2 Infrastructure and Construction Materials Transport Route

All deliveries of project components and construction materials to the site of the Proposed Project will only be by way of the proposed haul route outlined in Figure 4.7. The number of construction vehicles that will be generated during the construction phase of the Proposed Project is outlined as part of the traffic and transport assessment in Chapter 13 of this EIAR.



MAP TITLE: Solar Farm Haul Route	MAP NO.: Figure 4.7	SCALE: 1:30,000
PROJECT TITLE: 160727 - Timahoe Solar Project, Co. Kildare		DATE: 06-12-2018
DRAWING BY: Eoin Gilson	CHECKED BY: Michael Watson	ISSUE NO.: 160727-2018.12.06

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4.6.3 Traffic Management

A traffic management plan has been set out in the CEMP in Appendix 4-5 of EIAR. Prior to the construction of the Proposed Project, a detailed traffic management plan will be prepared by the haulage company and submitted to Kildare County Council for approval. This will include a delivery schedule and details of works or any other minor alteration identified.

Locals in the area will be informed of any upcoming traffic related matters via letter drops and posters in public places. Information will include the contact details of the Contract Project Co-ordinator, who will be the main point of contact for all queries from the public or local authority during normal working hours. An "out of hours" emergency number will also be provided.

4.7 Site Drainage

4.7.1 Introduction

The drainage design for the Proposed Project has been prepared by ESBi and is included in Appendix 8-1. The protection of the watercourses within and surrounding the Proposed Project site, and downstream catchments that they feed, is of utmost importance in considering the most appropriate drainage proposals for the site of the Proposed Project. The Proposed Project's drainage design has been proposed specifically with the intention of having no negative impact on the water quality of the site and its associated rivers and streams, and consequently no impact on downstream catchments and ecological ecosystems. No routes of any natural drainage features will be altered as part of the Proposed Project and the Solar Farm design was selected to avoid natural watercourses. Discharge into the Mulgeeth stream will be via the proposed connector drain to allow for the field ditches to drain towards the watercourse and flow offsite at a controlled rate. Buffer zones around the existing drainage features have constrained the layout of the Proposed Project.

4.7.2 Existing Drainage Features

During its commercial use for peat extraction, a network of drains was formed to allow for harvesting of peat. This consisted of wide man-made drains running in a northwest-southeast longitudinal direction, spaced c. 250m apart and totalling 11 main (continuous) longitudinal drains across the full width of the bog. There are a number of other, similarly orientated, drains that are discontinuous with standing water only. To assist with the construction and operational stage of the Proposed Project these drains will be cleaned and maintained.

During the various site inspections, the majority of field ditches did not show significant signs of clear flow and in some places only contained standing water. It is likely that many of the culverts that connect the drain under railway lines are blocked or partially collapsed at this stage. The Mulgeeth watercourse was the only watercourse that demonstrated effective drainage discharge from Proposed Project the site. As a result of the impeded drainage at the Proposed Project site, a permanent wetland area was observed around the Mulgeeth watercourse and the southern railway line which is likely to be a result of the watercourse backing up during heavy flow events. The lack of flow from the site's field drains has resulted in a large quantity of water attenuating on site throughout the year.

There is a permanent wetland area located around the Mulgeeth watercourse and the southern railway line. This area acts as a water storage area during wetter times of the year when the Mulgeeth backs up. As main drains onsite are not free draining and pumping is no longer required, there is a significant amount of standing water which remains onsite throughout.

Further information relating to historical and existing drainage can be found in Chapter 8 and in the Site Drainage Report in Appendix 8-1.

Where artificial drains (i.e. man-made drains commonly used to manage water in peatland environments) are currently in place in the vicinity of proposed works areas, these drains will be utilised in the proposed drainage design. These drains will connect to the proposed large connector drain along the proposed access track; connecting all field ditches to the discharging Mulgeeth watercourse.

4.7.3 Drainage Design Principles

Surface water drainage systems developed in line with the ideals of sustainable development are collectively referred to as Sustainable Drainage Systems (SuDS). It is proposed that SuDS techniques are utilised wherever possible to manage surface water runoff from the development. Surface water management proposals for the Proposed Project have been formulated to mimic the natural drainage patterns of the site.

The design principal on which drainage from the site will be managed is on the basis of flow separation, whereby separate "clean" and "construction / operational" drainage systems will be employed. The clean system will capture and manage runoff from areas of the site unaffected by the works and the construction/operational (C/O) system will accommodate runoff from the working areas of the site.

The key purpose of the drainage network will be to minimise the risk of the ingress of silt laden runoff from the construction and operational areas of the Proposed Project entering the surrounding habitats and local streams. Drainage from construction and operational areas will be directed to settlement ponds before discharging to surface water flow. Interceptor drains will be put in place to divert surface water from areas where no construction activity is occurring away from the construction locations.
To maximise the effectiveness of the separation of clean and C/O flows, the clean drainage works will be installed immediately prior to the main earthworks activities related to the construction of site tracks, solar panel foundations, cable trenches, crane hardstands and the substation.

The design of the track construction is such as to minimise the impact on the natural drainage patterns by allowing surface drainage to pass under the new track at closely placed intervals, corresponding with existing natural drainage lines where possible.
To intercept the clean surface water run-off before it reaches the construction and operational parts of the site, cut-off drains will be installed on the up-gradient side of the access tracks and inverter pads. These will generally follow the natural contour of the ground at relatively low gradients and convey drainage to nearby low points where it will be culverted beneath the site tracks or area of inverter pad. The size of the cut-off drainage channel and associated culverts will reflect the respective catchments and rates of run-off applicable to the site.

Additional information on the site drainage including drainage layout drawings can be seen in the Site Drainage Report in Appendix 8-1.

4.7.4 References

The drainage design has been prepared based on experience of the project team of other renewable energy sites in peat-dominated environments, and the number of best practice guidance documents referred to in the References section of the EIAR.

4.7.5 Solar Farm Drainage

In order to mimic the existing drainage on the Proposed Project site, the large field drains will be utilised throughout the site. In the areas between the field drains it is proposed to capture rainfall within the solar fields in small collector swales. The collector swales will be spaced approximately every 30 m.

They will be located between the solar panels and will flow towards an adjacent field ditch. It is proposed that the collector swale locations are finalised onsite as they may be required in low lying areas or at lesser intervals depending on the topography of the area. An illustration of the proposed drainage system for the solar panels is provided in Plate 4.7.

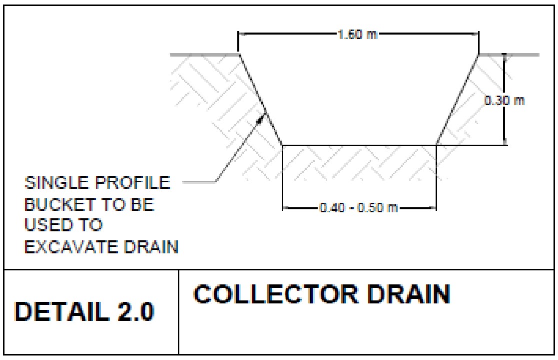


Plate 4.7 Example of collector drain

4.7.5.1 Additional Infrastructure

Additional drainage systems including a dewatering system and surface water pipe system, will also be installed within the Solar Farm development area, at the battery storage area and inverter areas. Further detail is provided in Appendix 8-1

4.7.6 Substation Drainage

The substation drainage will consist of a surface water, foul water and potable water system. Further detail is provided in the Site Drainage Report in Appendix 8-1.

4.7.6.1 Surface Water System

This system will include several surface water manholes, rain water pipes for the compound building roof, Class 1 Full Retention Oil Separator, an oil sensitive bund dewatering system and ACO Drains. The system will discharge in an adjacent field ditch. It is also proposed to construct a land drain, 150 mm in diameter, around the perimeter of the substation. The land drain will discharge in the same location as the surface water system. It is also proposed to include two rainwater harvesting tanks within the surface water system which will comprise of a filter, an underground tank and a pump.

4.7.6.2 Foul Water System

A foul system is proposed within the substation to cater for the wastewater generated in the welfare facilities of the control building. The foul system will consist of an underground pipe network, foul manholes and an 18 m^3 full retention foul effluent storage tank.

4.7.6.3 Potable Water System

The proposed substation site is remote from the public roadway and the public water supply system. It is proposed to provide the required potable water demand of the substation with a well on the site.

4.7.7 Proposed Project Drainage Design

A detailed drainage design for the Proposed Project, incorporating all principles and measures outlined in this drainage design description, has been prepared, and is included in Appendix 8-1 to this EIAR. The drainage design employs the various measures further described below.

4.7.7.1 Connector Drain

The existing field ditches will feed into a proposed connector drain which is to be constructed along the access road. This drain will flow towards the Mulgeeth watercourse. Currently, the field ditches flow in a south east direction towards the existing railway line but are not free flowing. The construction of the connector drain will allow for all the field ditches within the Proposed Project site to become free flowing. This will also allow for the field ditches to drain towards the Mulgeeth watercourse and flow offsite at a controlled rate.

Cleaning of vegetation within the field drains will be carried out where required to ensure they are free flowing. It is proposed that the connector drain be a V shaped ditch, approximately 1 m to 1.5 m deep with a top width of 6 m to 10 m depending on the depth of the peat. It is proposed to install culverts where the connector drain crosses under the access road. Six culverts are required in total with three at both sites.

It is proposed that the peat excavated during the construction of the drain be side casted if possible. A number of sediment control measures should be implemented during the construction of the drain which should include clean water drains and silt fences. No peat should be stored close to any field drain or watercourse. A buffer zone around field ditches and watercourses where no peat can be stored should be implemented. A 25 m buffer around field drains and a 50 m buffer around the Mulgeeth watercourse is in place

4.7.7.2 Swales

Swales are designed to slow and capture run-off by spreading it horizontally across the landscape, facilitating infiltration of the runoff into the soil. A swale will be created by digging a ditch and placing the excavated material on the downhill side of the ditch to create a berm. Drainage swales are shallow and are useful during the construction phase. [Drainage swales will remain in place to collect runoff from roads and hardstanding areas of the Proposed Project during the operational phase. A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. They are similar in design to collector drains described above.

Drainage swales will be installed in advance of any main construction works commencing. The material excavated to make the swale will be compacted on the downslope edge of the drain to form a diversion dike.

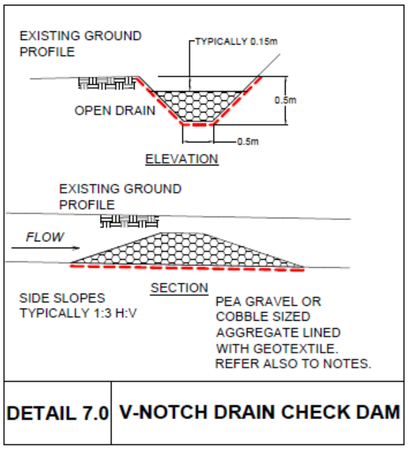
4.7.7.3 Check Dams

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fibre rolls or reusable product. They will be placed across the constructed swale or drainage channel, thereby reducing the effective slope of the channel. The velocity of flow in the interceptor drains and drainage swales, particularly on sloped sections of the channel, will be controlled by check dams, which will be installed at regular intervals along the drains to ensure flow in the swale is non-erosive. This will result in a reduced water flow, allowing sediment to settle and thereby reducing erosion.

Due to the relatively flat topography within the Solar Farm it is not foreseen that a significant number of check dams will be needed. Plate 4.8 below, shows illustrative examples of check dams.

Check dams will not be used in any natural watercourses, only artificial drainage channels and interceptor drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events.

Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam. Further information on check dams is noted in Appendix 8-1 Site Drainage Report.



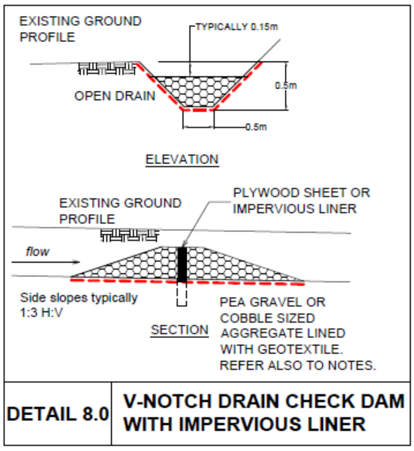


Plate 4.8 Examples of check dams

4.7.7.4 Vegetation Filters

Vegetation filter strips are areas adjacent to watercourses that are to remain in an undisturbed state throughout and after the development. The vegetation will act as an effective screen/ barrier between the stream and the development area, intercepting runoff and acting as an effective filter for sediment and pollutants from the development area.

A vegetation filter strip may be:

- a constructed flat area of vegetation at a point discharge that traps sediment, enhances filtration and can slow down runoff that could enter the local surface waters,
- or an area that is left undisturbed alongside existing streams.

This measure allows the vegetation to act as a drainage area for the stormwater and operational surface runoff throughout some areas of the site. This method of collecting and treating operational runoff is the preferred method wherever possible.

4.7.7.5 Settlement Ponds

Provision is made for additional protection measures in areas where vegetation filter strips and swales are not considered sufficient on their own, due to the nature or availability of the vegetation and the volume of surface runoff that needs to be treated. In these cases, settlement ponds will be constructed.

Settlement ponds reduce the turbulence of drainage discharges and facilitate the settlement of solid particles entrained in the water. Settlement ponds may be built in-situ and sized depending on expected flows. They need relatively flat areas for construction.

The settlement ponds were sized individually based on expected flows derived from Return Period Rainfall depth estimates for Timahoe supplied by Met Éireann. Each settlement pond has been designed for a rainfall return period of 30 years and for the first flush (15 mm) of rainfall across the contributing area.

The ponds have been sized so that the time of travel through the pond, for the design rainstorm, is sufficient to allow a high percentage of suspended solids to settle within the pond, followed by further removal across the vegetated area downstream. The required time of travel depends on the vertical settling velocity of eroded peat excavated during construction. During operation, most of the particle sizes and settling velocities are likely to be higher than for peat.

4.7.7.6 Culverts

A survey of all existing stream culverts and proposed watercourse crossings within the study area boundary was undertaken as part of the assessment. A site visit in April 2018 noted that the 11 field ditches identified on site would have flowed under the railway line through 300/450mm culverts where they continued flowing southeast towards the southern boundary. At present it is difficult to assess the condition of the culverts which provide a flow route under the raised disused railway line. The drains outfall into an outflow collector drain located along the northwest and southeast boundaries via small pipe culverts.

As part of the proposed site drainage, it is planned to install six culverts where the connector drain crosses under the access road.

Under existing drainage conditions, the proposed solar development has a significant residual flood risk associated with potential blockage to individual longitudinal drains, particularly at the small pipe culverts under the both disused railway lines (the south and south east). These longitudinal drains flow southeast through 2 small existing submerged culverts on ten of the eleven drains and a single existing culvert on drain 7. This represents 21 culvert sites of potential blockage.

To reduce elevated flood levels in individual longitudinal drains through the Solar Farm site and to minimise the exposure to residual risk from blockage, a new oversized culvert under the disused rail line track on drain 7 will be installed to transmit unrestricted flow downstream. The recommended culvert size under the disused rail line track to convey all drainage waters downstream without restriction and avoid blockage and sedimentation problems is a 2.4 by 2.4m box culvert section (Refer to Appendix 8-2, Figure 5 for drain numbering and locations).

Furthermore, to manage and control the flood outflow from the bog, so as not to exceed existing flood runoff rates downstream in the Mulgeeth Stream a flow control structure is required on the outlet of drainage channel (D7). This flow control structure is a single 900mm diameter culvert with a concrete spillway set at a crest level of 79.5m OD Malin. The flood control structure will be designed to throttle flood flows from the site so as not to exceed the existing flood flows. Under the existing 100-year and 1000-year Flood events the peak outflow from the bog was computed to be 1.59 and 1.96cumec respectively for the existing drainage case. Simulations show that for the proposed case with the 900mm diameter culvert throttle the outflow from the bog will be 1.49cumec and 1.78cumec at 100 and 1000year return period respectively

Culverts will be suitably designed for base flows and peak flows, with a minimum size to avoid occurrence of blockages and build-up of discharges and to avoid increased flow velocities with the potential to cause erosion. They will also be designed in accordance with the requirements of IFI's Requirements for the Protection of Fisheries Habitats during Construction and Development works at River Sites.

All culverts will be inspected regularly to ensure they are not blocked by debris, vegetation or any other material that may impede conveyance.

4.7.7.7 Silt Fences

Silt fences will be emplaced along drains and parallel to access roads edges as required and at stream / watercourse crossings, as an additional water protection measure. Silt fences are effective at removing heavy settleable solids. This will act to prevent entry to watercourses of sand and gravel sized sediment, released from excavation of peat and entrained in surface water runoff.

All silt fencing will be formed using Terrastop Premium or equivalent silt fence product as seen in Plate 4.9 below.

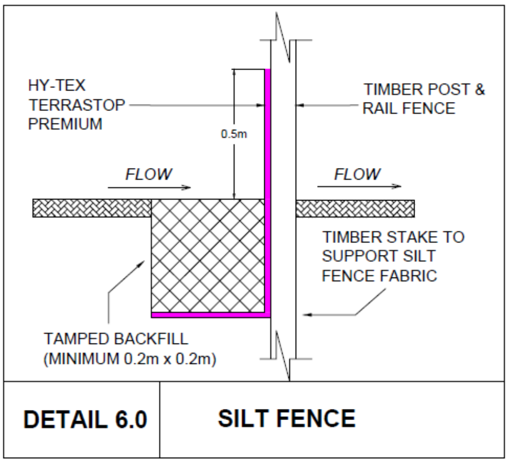


Plate 4.9 Proposed Silt Fence

Silt fences will be inspected regularly to ensure water is continuing to flow through the fabric, and the fence is not coming under strain from water backing up behind it.

4.7.8 Site and Drainage Management

4.7.8.1 Preparative Site Drainage Management

All materials and equipment necessary to implement the drainage measures outlined above, will be brought on-site in advance of any works commencing. An adequate amount of straw bales, clean stone, terram, stakes, etc will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures outlined in the above will be installed prior to, or at the same time as the works they are intended to drain.

4.7.8.2 Pre-emptive Site Drainage Management

The works programme for the groundworks part of the construction phase of the Proposed Project will also take account of weather forecasts and predicted rainfall in particular. Large excavations, large movements of peat/material or large-scale vegetative clearance will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

4.7.8.3 Reactive Site Drainage Management

The final drainage design prepared for the Proposed Project prior to commencement of construction will have to provide for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously by the environmental clerk of works or supervising hydrologist on-site. The environmental clerk of works or supervising hydrologist will respond to changing weather, ground or drainage conditions on the ground as the Proposed Project proceeds, to ensure the effectiveness of the drainage design is maintained in so far as is possible. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site.

In the event that works are giving rise to siltation of watercourses, the environmental clerk of works or supervising hydrologist will stop all works in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

4.7.9 Drainage Maintenance

It is critical that the drainage measures listed above are regularly inspected and maintained during both the construction and operational phases of the Proposed Project. During construction the Contractor shall produce an inspection and maintenance plan for the drainage system onsite which will be prepared in advance of commencement of any works on the Proposed Project. Regular inspections of all installed drainage features will be necessary to check for blockages, and ensure there is no build-up of standing water within the system where it is not intended. The inspection of the drainage system will be the responsibility of the environmental clerk of works or the supervising hydrologist.

If necessary, any excess sediment build up behind check dams will be removed. For this reason, check dams will be inspected and maintained weekly during the construction phase of the Proposed Project to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

Check dams will also be inspected weekly during the construction phase of the Proposed Project and following rainfall events to ensure the structure of the dam is still effective in controlling flow. Any scouring around the edges of the check dams or overtopping of the dam in normal flow conditions will be rectified be reinforcement of the check dam.

Drainage swales will be regularly inspected for evidence of erosion along the length of the swale. If any evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel and reduce the likelihood of erosion occurring in the future.

In the operational phase of the Solar Farm a site specific O&M plan shall be established.

The frequency of drainage system inspections will be reduced following completion of the construction phase of the Proposed Project. Weekly inspections during the construction phase will be reduced to monthly, bi-monthly and eventually quarterly inspections during the operational phase. The frequency will be increased or decreased depending on the effectiveness of the measures in place and the amount of remedial action required in any given period

4.8 Construction Management

4.8.1 Construction Timing

It is estimated that the construction phase of the Proposed Project will take approximately 25 months, from commencing enabling works on site to the commissioning of the Solar Farm and Substation and Grid Connection. The final programme will be developed in consultation with the Project Supervisor Construction Stage, based on availability of plant, materials and projected delivery dates.

4.8.2 Construction Sequencing

Prior to commencement of the construction phase, a geotechnical site investigation will be undertaken in order to confirm the findings of preliminary studies. The construction phase will occur over two phases. The main task items under each of the two phases are outlined below.

1. Enabling Works

Prior to main construction works there will be a period of approx. 5 months of site preparation, clearance of forestry and vegetation which is required to be removed to enable main construction works to proceed. This may also include preparing the perimeter and erecting where necessary a temporary fence. Temporary welfare amenities for construction workers will be installed close to the substation area during this period. A percentage of access tracks will be constructed at this stage to facilitate enabling works. Furthermore, some of the initial drainage works may be completed.

2. Main Construction Works

The final programme will be developed in consultation with the Project Supervisor Construction Stage, based on availability of plant, materials and projected delivery dates, and should be completed in approximately 20 months duration.
The Works shall include the following activities:

- Erection of fences & gates
- Preparation of onsite tracks and laydown areas.
- Restoration of existing drainage and installation of new site drainage works
- Construction of inverter pads
- Installation of piling for the panel supports
- Delivery of panels, frames, centralised electrical stations
- Installation of frames and panels
- Construction of 110 KV Substation

- Cable trenching and cable laying
- Erection of security cameras
- Installation of centralised electrical stations
- Commissioning of the panels and grid connection
- Site reinstatement and ecological enhancement
- Demobilisation from site.

Construction works will be undertaken in approximately the order listed above. However, many of the tasks would be undertaken concurrently in order to minimise the duration of this phase.

Construction work will be scheduled to only occur between the hours of 07:00 to 19:00 on Monday to Friday and 07:00 to 13:00 on Saturday. Construction activities will be restricted to this times except where the nature of particular specialist works requires continuous working for longer periods. Any such exceptions will be agreed in advance with the local authority.

4.8.3 Construction Phase Monitoring and Oversight

The requirement for a Construction and Environmental Management Plan (CEMP) to be prepared in advance of any construction works commencing on any renewable energy site and submitted for agreement to the Planning Authority is now well-established. The proposed procedures for the implementation of the mitigation measures outlined in such a CEMP and their effectiveness and completion is typically audited by way of a Construction and Environmental Management Plan Audit Report. The CEMP Audit Report effectively lists all mitigation measures prescribed in any of the planning documentation, all conditions attached to the grant of planning permission and any further mitigation measures proposed during the detailed design stage, and allows them to be audited on a systematic and regular basis. The first assessment is a simply Yes/No question, has the mitigation measure been employed on-site or not? Following confirmation that the mitigation measure has been implemented, the effectiveness of the mitigation measures has to be the subject of regular review and audit during the full construction stage of the Proposed Project. If some remedial actions are needed to improve the effectiveness of the mitigation measure, then these are notified to the site staff immediately during the audit site visit, and in writing by way of the circulation of the audit report. Depending on the importance and urgency of rectifying the issue, the construction site manager is given a timeframe by when the remedial works need to be completed.

A Construction Environmental Management Plan (CEMP) has been prepared for the Proposed Project and is included in Appendix 4-5 of this EIAR. The CEMP includes details of drainage, peat and overburden management, waste management etc, and gives examples of how the above-mentioned Audit Report will function and be presented. It is intended that the CEMP will include all mitigation measures, planning conditions and any other relevant consideration that may emerge during the course of the planning process, and would be submitted to the relevant Planning Authority for written approval.

The on-site construction staff will be responsible for implementing the mitigation measures specified in the EIAR and compiled in the Audit Report. Their implementation will be overseen by the environmental clerk of works or supervising hydrogeologists, environmental scientists, ecologists or geotechnical engineers, depending on who is best placed to advise on the implementation. The system of auditing referred to above ensures that the mitigation measures are maintained for the duration of the construction phase, and into the operational phase where necessary.

4.9 Construction Methodologies

4.9.1 Solar Array Foundations

Each of the solar array panels erected on site will be installed and mounted on fixed ground-mounted frames after piling has taken place on site. Piling will be carried out by tracked dumpers and trailers which will transfer material around the site and where there is suitable bearing stratum, double wheeled vehicles will also be used for transport of materials from the holding areas to the work areas.

Mini piling rigs will travel on top of the vegetated peat surface and will be used to drive the mini piles into the underlying soils, to a suitable embedment depth to support frames. It is envisaged that piling will be executed in the areas of deeper peat using a wide track piling machine of approx. 14 tonnes. Detailed strategic planning will be required at piling stage to ensure minimal passes across the peat and ensure disruption to peat surface is kept to a minimum.

Temporary support in the form of bog mats/temporary matting will be used to support machines to execute piling and transfer of materials in areas where the soil is of poor stability.

The exact dimensions and spacing of piles will be determined at detailed design stage following calculations incorporating appropriate factors of safety will be considered. These will be based on detailed geotechnical investigations, which will include exploratory boreholes as necessary across the Proposed Project site with associated sampling and laboratory testing. The depth of individual piles will vary according to the depth to competent subgrade. Refer to Appendix 4-4 for all Foundation Construction Methodologies.

4.9.2 Site Tracks

The access track network required throughout the site to facilitate construction of the Proposed Project will extend to approximately 3.5 km of main access tracks, approximately 12 km of spur tracks and an additional amenity trackway of approximately 2 km in length.

All site roads will be constructed as detailed in Section 4.5.1 above. The type of track used is determined by the CBR ratings confirmed for floating roads, with it being estimated that the majority of track will be floated. Where excavation does occur; peat material is excavated and rock up fill is used to fill up to road formation level. Peat is then either transported to peat repositories for permanent storage or at areas where levels are permissible, peat will be side casted and revegetated to side of access tracks.

Stone for the building of tracks will be sourced locally.

In the event of large clay deposits being encountered in sections of road, a geotextile layer will be required at sub base level. The sub grade will be compacted with the use of a roller. All tracks will be maintained for the duration of the operation of the Proposed Project.

4.9.3 Onsite Electricity Substation and Control Building

The proposed 110 kV substation will take approximately 14 months to construct.

The substation will include plinths to support electrical equipment including transformer, cable ducts, etc. The compound will be enclosed with security fencing on which warning, project description and interpretation signage will be attached. The two control buildings will be single storey and will consist of a pitched roof supported on blockwork cavity walls on reinforced concrete strip footings. Hard finishes will be provided for the majority of floor areas throughout the building. These will provide durable surfaces that enhance the building environment and are easy to clean. External doors and escape doors will generally comprise metal flush doors and mild steel frames.

The Grid Transformer(s) will be delivered on a multi-axle special purpose tractor and trailer transport that will distribute this load over eight or more axles, which results in acceptable loads.

Once tree felling as described in Section 4.5.3 is completed, the onsite substation will be constructed by the following methodology:

- Site clearance involving stripping of approximately 25,000 m3 of peat from construction areas to be stored in peat repositories and rock fill used to make up levels to finished ground level (FGL). The peat will be stored at maximum of 1 m high in areas shown on the layout drawing;
- Earthworks to achieve a flat working area for the compound;
- Installation of surface water drainage pipework;
- Installation of 18 m3 foul water holding tank, which will be fitted with a high level warning sensor to the control room. A maintenance plan will be kept by the operations and maintenance team;
- Excavation of structural foundations to formation level for the control buildings and outdoor equipment, and pouring of ready-mixed concrete to bases and floors;
- Installation of ducting for electrical cables, communication cables, lighting, etc.;
- Construction of control buildings, refer to foundation report to see detailed proposed potential foundation details;
- Installation of 110 kV transformers within impermeable bunds / oil interceptor and all other high voltage (HV) equipment;
- Wiring and cabling of HV equipment and protection and control cabinets; and
- Commissioning of all newly installed equipment.

4.9.4 Temporary Construction Compound

The temporary construction compounds will be constructed as follows:

- The area to be used as the compound will be marked out at the corners using ranging rods or timber posts. Drainage runs and associated settlement ponds will be installed around the perimeter;
- The compound platform will be established using a similar technique as the construction of the substation platform discussed above;
- A layer of geo-grid will be installed and compacted layers of well graded granular material will be spread and lightly compacted to provide a hard area for site offices and storage containers;
- Areas within the compound will be constructed as site roads and used as vehicle hard standings during deliveries and for parking;
- The compound will be fenced and secured with locked gates; and,
- Upon completion of the Proposed Project, the temporary construction compound in the southern area of the site will be decommissioned by

backfilling the area with the material arising during excavation, landscaping with topsoil/peat as required. The temporary northern compound will be covered with solar panelling after the northern area of the site is complete as discussed in Section 4.3.3 above.

4.9.5 110 kV Overhead Line Grid Connection

The construction techniques carried out will be in line with international best practice and fully comply with all health and safety requirements. In general, construction can be broken down into the following parts:

- Verify that all planning and environmental conditions have been satisfied;
- Carryout pre-construction site investigations including access review and ground conditions;
- Delineation of any on-site working area (e.g. erection of temporary fencing)
- Setting out of tower foundations and polesets
- Site preparation works including minor civil works such as removal of fences and erection of temporary fencing
- Installation of tower foundations
- Erection of towers and polesets
- Stringing of conductors and commissioning

The proposed 110 kV line will be constructed of double wood polesets at intermediate locations and galvanised steel lattice towers at angle positions going towards the substation. The location of these can be noted in Figure 4.1. This style of construction is the standard type of construction used for 110 kV single circuit lines in Ireland. Plates 4.10 and 4.11 below show the structure types to be used on this project. Further information can be found in the Appendix 4-3 Construction Methodology.

Plate 4.10 Typical Wood Poleset

Plate 4.11 Typical Steel Angle Structure

The terrain is generally undulating and in wet areas temporary roads or bog-mats may be required in order to access sites without causing excessive damage.

Prior to commencement of work the contractor(s) will prepare a separate Construction and Environmental Plan for the overhead line, further details of which are included in Appendix 4-5.

4.9.5.1 Pole base excavation and pole erection

Double wood polesets are used for all straight-line structures.
As noted in Appendix 4-3 Construction Methodology, the following methodology is proposed for pole base excavations and pole erections:

- The excavation for each pole will be carried out using a wheeled or tracked excavator;
- Each of the two poles are lined up with the excavated holes and the machine operator then drives forward pushing the pole up until the pole is in an almost vertical position. The pole never passes through the point of balance in the vertical position;
- The pole is supported at all times and the holes manually backfilled to a minimum depth of 1.0 m;
- After excavation and erection of the poleset a further excavation 800 mm deep is necessary. This is a linear excavation perpendicular to the line necessary to install wooden sleepers. These sleepers add additional stability to the poleset and are attached to the poleset using a U-bolt;
- The two installed poles are connected near the top by a steel cross-arm from which three insulators are attached. The conductor is then attached to these insulators during the stringing process;
- As much of this overhead line is designed as an earth wire line an earth grid is required on all polesets. This earth grid is a section of earth conductor forming a loop underground around the installed poleset. It is connected to the shield wire on the pole top by another section of earth conductor running along the length of the pole; and
- In poor ground conditions stay wires may be required at some poleset locations. These wires add stability to the pole and are supported by means of stay blocks. These stay blocks are made of concrete and are buried underground.

4.9.5.2 Installation of 110 kV steel tower foundations

Steel Angle towers are only used where the line changes direction. The Proposed Project identifies the need for 4 angle masts on site. As noted in Appendix 4-3 Construction Methodology, the following methodology is proposed for the 110 kV steel tower foundations:

- All structure locations will be checked for underground services such as cables, water pipes etc. Consultation of existing services maps will help to confirm the location of these underground services. If field drains are encountered these will be diverted and all diversions marked on as built drawings;
- The tower will be set out and pegged prior to foundation excavation. This may require excavation of some existing ditches or drains to allow clear pegging of each individual leg footing for excavation. All such removals are restored upon completion of foundation works. Excavations are set out specifically for the type of tower and the type of foundation required for each specific site;
- The tower stubs (lower part of tower leg) will be concreted into the ground. For each leg of the tower (4 in total) a foundation is excavated using a tracked excavator and the formation levels (depths) checked by the onsite foreman. Each of the four corners of the tower will be separately anchored below ground

in a block of concrete. Any water in the excavation is pumped out prior to any concrete being poured into the foundation. Concrete trucks shall be brought as close as possible to the excavation to pour directly into the excavation. In the event of this not being possible concrete shall be transported in dumpers, in the event that the ground is very poor and wheel dumpers will not transport the concrete over the terrain, track dumpers may be used;

- In areas of poor ground or high water table it may be necessary to use sheet piles supported by hydraulic frame(s) to prevent collapse of the sides of the excavation and also to prevent the excavation becoming too large. During any dewatering activities a standard water filtration system will be utilised to control the amount of sediment in surface water runoff;
- After this, the remaining part of the foundation, the concrete shear block or neck is formed using shuttering;
- During each pour the concrete shall be vibrated thoroughly using a vibrating poker. In the event that sheet piles have been used these are removed (pulled) at this stage. Care is taken not to damage the base members of the tower. The shear block formers are removed at this stage; and
- The tower foundations are backfilled one leg at a time with the excavated material. The backfill is placed and compacted in layers. All dimensions are checked following the backfilling process. If the excavated material is deemed unsuitable for backfilling imported fill material may be used also compacted in layers. When the base construction crew leaves site they shall ensure all surplus materials are removed from the site including all unused excavated fill.

Once the tower base is completed and fully set (usually after seven days) it is ready to receive the tower body which is normally constructed in an area near the foundation site ready to be lifted and bolted into place.

4.10 Operation

The Proposed Project is expected to have a lifespan of approximately 35 years. Planning permission is being sought for a 35-year operation period commencing from the date of full operational commissioning of the Proposed Project. During the operational period, on a day-to-day basis the Solar Farm will operate automatically, responding by means of control systems to changes in sunlight.

The solar arrays will be connected together, and data relayed from the inverter to the off-site control building. The system proposed includes lithium-ion batteries, connected to inverters that convert direct current (DC) to alternating current (AC), which in turn connected to the Independent Power Producer's (IPP) control building. The monitoring of solar panel output and performance, will be monitored at an off-site control centre 24-hours per day.

The Proposed Project site will be subject to a routine maintenance programme involving a number of checks and changing of consumables. In addition, there will be a requirement for unscheduled maintenance, which could vary between resetting alarms to component changes. Typically, maintenance traffic will consist of four-wheel drive vehicles or vans. The electricity substation components and site tracks will also require periodic maintenance.

4.11 Decommissioning

The solar infrastructure proposed as part of the Proposed Project are expected to have a lifespan of approximately 35 years. Following the end of their useful life, the solar infrastructure may be replaced, subject to planning permission being obtained, or the Proposed Project may be decommissioned fully. Individual panels may need to be replaced during the lifetime of the Proposed Project and this will occur on an as needed basis. The onsite substation will remain in place as it will be under the ownership of the ESB/EirGrid.

Upon decommissioning of the Proposed Project, the solar panels would be disassembled in reverse order to how they were erected. All above ground components would be separated and removed off-site for recycling. Foundations would remain in place underground and would be covered with earth and reseeded as appropriate. Leaving the piling in-situ is considered a more environmentally prudent option, as to remove piling could result in significant impact on the peatland habitat. Underground internal collector cables will be removed and sent to an authorised waste recovery facility, and the ducting left in place. The Substation and associated 110kv infrastructure is likely to remain in place as a integral part of the national grid network. A decommissioning plan will be agreed with Kildare County Council in advance of decommissioning the Proposed Project. An outline decommissioning plan is contained in the CEMP in Appendix 4-5.