3. PROJECT IMPLEMENTATION

Additional information relevant to Section 3 is presented in Appendix C in Volume 2 of 3 of the EIS.

3.1 PROJECT CONSTRUCTION

3.1.1 Scope

Construction will principally involve the following:

- Construction of site entrances and initial access tracks.
- Establishing temporary site facilities including site offices, construction laydown and storage areas.
- Earthworks and drainage for the provision of turbine access, cranepads and the Substation.
- Fixing of formwork and steel reinforcement for the turbine foundations, and construction of reinforced concrete bases with cast-in steel foundation section for the tower and backfilling around foundations.
- Reinstatement of areas around turbine bases and track edges.
- Works to facilitate delivery of wind turbine components via Ballyvourney or Clonkeen, with the former entailing a temporary bridge at Ballyvourney and the latter entailing some tree felling.
- Erection by crane of the turbine towers, nacelle and rotor blades.
- Construction of anemometer masts.
- Installation of underground cabling from each turbine to Coomataggart 110 kV Substation.

Further to the above, the following will be undertaken:

- Construction of Coomataggart 110kV Substation containing the Control Buildings and electrical equipment.
- Installation of ducts and cabling from Coomataggart 110 kV Substation to Ballyvouskill 220/110 kV Substation.

3.1.2 Construction Environmental Management Plan

Each Contractor appointed to carry out construction works for this project will be required to prepare a site specific Construction Environmental Management Plan (CEMP) for work within their scope. The CEMP will identify the staff responsible as well as the steps and procedures that will be implemented to minimise the environmental impacts resulting from the site preparation, groundwork and construction phases of the project.

Approval and ongoing auditing by the Developer of this Plan will be a feature of the contract.

The following outlines, as a minimum, the features required in the CEMP.

- Introduction including background details to contract and the parties involved.
- Contractor's environmental policy and procedures.

- Contractor's management structure which will identify the project management structure and clearly identify the roles and responsibilities with regard to managing and reporting on the construction phase environmental aspects.
- An Environmental Risk Assessment and Risk Register together with the management controls proposed to eliminate and/or minimise the identified impacts.
- A Geotechnical Risk Register (GRR) to monitor the risks and risk reduction strategies proposed as part of the detailed design for the access tracks and hardstandings.
- Proposals on Environmental Training including site induction training, specialist environmental training and toolbox talks.
- Procedures for Method Statements / Permits to Work, to incorporate any CEMP requirements relevant to the work.
- Monitoring, auditing and reporting. Contractor's procedures and scope for daily monitoring, weekly auditing and reporting on CEMP.
- Procedures for handling external communications / complaints, liaison including the development and maintenance of a clear audit trail.
- Procedures for monitoring, recording and disseminating the environmental information and performance.
- Procedures for addressing non-compliance and corrective actions
- Procedures for dealing with major incidents.

The operation of the Plan will be supervised on a daily basis by the resident supervisory staff augmented by regular audits by visiting staff.

3.1.3 Site Management

A full construction management team will be deployed on site in accordance with routine site construction procedures. This team will consist of a Resident Site Manager and Assistant Engineers as appropriate.

An Ecological Clerk of Works, who will be supported by an independent Project Ecologist, will be appointed for the duration of the works so as to ensure compliance of ecological mitigation measures.

A Geotechnical Supervisor, supported by a Geotechnical Engineer as appropriate, will be part of the site staff.

All construction works will be carried out under appropriate supervision. Works will be carried out by experienced contractors using appropriate and established safe methods of construction. All requirements arising from statutory obligations including the Safety, Health and Welfare at Work Act and associated regulations will be met in full.

3.2 TEMPORARY SITE FACILITIES

All temporary facilities will be fully removed upon project completion and the respective areas will be reinstated.

3.2.1 Contractor's Compounds

A suitably surfaced contractor's compound will be provided for offices, equipment storage and construction staff welfare facilities for the duration of the site works. Depending on the number of separate contractors involved, more than one compound may be provided.

Portable cabin structures will be used to provide temporary site offices and self-contained chemical-type toilets will be installed. These will be managed and serviced on a weekly basis or more frequently if required, and will be removed from the 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.

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.

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

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

3.2.2 Vehicle Wheel Wash

A designated vehicle wheel wash area will be created adjacent to the main site entrance where all vehicles will be cleaned prior to leaving the site.

The wheel wash will be a proprietary wheel wash approved by the 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.

3.2.3 Control of Oils & Fuel

Oils and fuels will be used in plant and equipment during the construction phase, and 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.
- 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.
- 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.
  - 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)

- Outside the contractor's compound(s) there will be short-term storage of fuels 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.
- Any waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or recycling.
- 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.

3.3 TURBINE ACCESS AND CRANEPADS

3.3.1 Access Tracks

The access track network required throughout the site to facilitate construction of the turbine bases and erection of the turbines will extend to approximately 28 km.

Construction will be to standards that meet the criteria for load carrying capacity of the ground over which the tracks will pass, for the axle loads of the vehicles and the total number of vehicles during the construction period.

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. 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.

Investigations have indicated that an adequate strength of formation will generally be achieved for the access tracks at a shallow depth. The tracks will generally be formed by excavating the existing overburden and placing a layer of coarse granular fill followed by a 100 mm layer of fine gravel. An average overall thickness of about 750 mm is envisaged.

The excavated material will be incorporated into the works by side casting evenly on the opposite side of the track to the constructed drainage channel. The material will be placed within the access track corridor and within 8 m of the track edge. Excavated topsoil and subsoil will be stored separately with the topsoil being used to cover the subsoil.

Some of the excavated material will be reused at the edges of the track with the remainder being landscaped to act as a berm along one side of the road edge.

Trackside drainage will be provided within the excavated width and will discharge into stilling ponds at regular intervals. The resulting discharge will be of an appropriate quality for release into the general drainage of the site.

3.3.2 Cranepads

Cranepads, which comprise level hardstandings, are required adjacent to each turbine base for the operation of a heavy lifting capacity crane and a smaller service crane used for assembly of the turbine components. These areas will be to the same general specification as the excavated tracks that they adjoin, but a slightly greater depth of construction is envisaged.

The excavated material will be used in reinstating the borrow pits.

3.4 WIND TURBINES

3.4.1 Turbine Bases

Foundations for wind turbines may be of the gravity, rock anchored or piled type. Gravity-based spread foundations are proposed at Grousemount and sizes will depend on site conditions that will be established by detailed geotechnical investigations.

However, it is expected that turbine bases will consist of reinforced concrete pad footings measuring approximately 18 m diameter with an average depth of 1.5 m, similar to those shown in Figure 3.1. They will incorporate an upstand / plinth into which a tower insert or fixing bolts will be embedded. At each turbine base the completed foundation will be covered with soil leaving only the concrete upstand / plinth outstanding. The upstand / plinth will be approximately 4 - 5 m in diameter, depending on the choice of turbine supplier.

The exact dimensions of foundations will be determined by pre-construction structural design calculations incorporating appropriate factors of safety. These will be based on detailed geotechnical investigations, which will include exploratory boreholes as necessary at each proposed turbine location with associated sampling and laboratory testing. The depth of individual foundations will vary according to the depth to rockhead or other competent subgrade. However, with their locations generally having shallow depths of peaty topsoil, it is anticipated that some rock excavation will be required for turbine foundation. It is foreseen that the excavated material will be available for use in construction, thereby reducing overall requirements for stone fill.

In design terms the substrata encountered at Grousemount are neither unusual nor problematic. In design terms, neither the ground conditions at the site nor the structural loads arising from wind turbines are particularly unique. Wind farm developments have been successfully designed for environments where bases are founded on strata that are similar to Grousemount and more commonly on other strata, such as peat, that are much less favourable.

The general method of construction of the turbine bases will be as follows:

- Marking out of the location of the foundation established from the construction drawing and the extent of the excavation.
- Excavating soil with provision of a surrounding working area to allow placing of shuttering, etc..
- Laying a layer of concrete blinding approximately 75 mm thick directly on top of

the newly exposed formation, tamped and finished with a screed board to leave a flat level surface. The concrete will be protected from rainfall during curing and all surface water runoff from the curing concrete will be prevented from directly entering surface water drainage.

- Fixing of high tensile steel reinforcement in accordance with the designer's drawings and schedules. The foundation anchorage system will be installed, levelled and secured to the blinding using steel box section stools.
- Installation of ductwork as required and erection of formwork around the steel cage and propping as required.
- Checking of the foundation anchorage system both for level and line prior to the concrete being installed in the base. These checks will be passed to turbine manufacturer for approval.
- Placing of concrete in two phases, namely the base pour and the pedestal pour, using pumps and compaction using vibrating pokers to the levels and profile indicated on the drawings. Upon completion of the concreting works the foundation base will be covered and allowed to cure.
- Following a curing period, where the foundation base will be covered to assist curing, formwork will be stripped off and stored for re-use.
- Backfilling the foundation with a cohesive material, where possible using the material arising during the excavation, and landscaping using the vegetated soil set side during the excavation.

Depending on the choice of turbine manufacturer, the turbine transformer will most likely be contained within the nacelle. In the unlikely event of a requirement to install the transformer outdoors, its foundation will be about 2.5 m x 2.5 m x 0.3 m deep and will be constructed of lightly reinforced concrete and situated adjacent to the turbine on backfill material.

An earthing mat or electrode will be installed at each turbine base. It will comprise earthing rods and up to three concentric rings of bare stranded copper conductor. The extent of the earthing will be determined by testing of electrical resistivity.

3.4.2 Turbine Installation

All individual wind turbine components and all electrical equipment will be the subject of factory testing prior to delivery to site.

The contractor may adopt a "Just in Time" system of delivery to site with a number of turbines delivered in advance of erection or an early delivery system with storage of wind turbine components on site.

Equipment will be shipped to Ireland either to an intermediate location, such as a shipyard, where it will be stored until required, or directly to site. For "Just in Time" type delivery, equipment will arrive on site the week it is required and turbine components will be delivered to the site on specialised long transporter vehicles.

Each turbine will be constructed by in-situ assembly of components carried out with the aid of a heavy lifting capacity main crane and a smaller capacity crane working in tandem.

Use of cranes will generally be as follows:

- A regular or crawler type crane of approximately 100 – 300 t capacity will be used for unloading hubs, blades and parts stacking, and for rotor builds

- A 300 – 500 t capacity crane will be used for rotor builds when extra boom length is required due to terrain / location problems. It will be used as a tail crane for tower sections and rotor lifts.
- A main lift crane, similar to that shown in Figure 3.2, will be used for the nacelle, bottom and top tower sections and rotor lift.

Each turbine will be erected over a 2 – 3 day period and the general method of construction of the turbines, as shown in Figures 3.3 & 3.4, will be as follows:

- Erection by crane of the pre-fabricated turbine towers and nacelle, and erection by crane of the of turbine rotor blades following on-site assembly,.
- Tightening of all fasteners to the correct torque upon completion of the erection and internal fit out of the turbines. Mains power will be connected to the turbine controller.
- Commissioning of the turbine when the controller is activated. The turbines will be handed over as complete following the successful execution of the ‘tests on completion’.

3.5 ANEMOMETER MASTS

Works for installation of anemometer masts will be similar to those for the wind turbine bases. Gravity-based spread foundations will be used and sizes will depend on site conditions that will be established by detailed geotechnical investigations.

However, it is expected that bases will consist of reinforced concrete pad footings measuring approximately 5 m x 5 m and 2 m deep.

3.6 UNDERGROUND SERVICES

3.6.1 Cables

All power and control cabling between the turbines and the substation will be laid underground in trenches running parallel and adjacent to the access tracks where possible.

Cables will be laid in a suitable bedding material, e.g. sand, at the base of the trench with the upper trench being backfilled with previously excavated material.

Where appropriate, the vegetation and top 100 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.

3.6.2 Site Drainage

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 wind farm from entering the 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, turbine foundations, crane handstands 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 hardstandings. 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 hardstanding. 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.

The Construction / Operational surface water system will incorporate the following features as appropriate:

- Vegetation filter strips: 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.
- 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.
- Settlement ponds: Settlement ponds are used to buffer larger volumes of run-off discharging from drainage systems during periods of high precipitation. The hydraulic loading to watercourses is reduced by retaining water in the settlement pond.
- 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. This will result in a reduced water, allowing sediment to settle and thereby reducing erosion.

3.7 BORROW PITS

3.7.1 Operational Methodology

The following general methodology will be employed in developing the borrow pits:

- The area to be developed for borrow pit operations will be set out and fencing will be installed to the perimeter of the area prior to commencement of any works.
- Cut-off drains will be installed as appropriate to intercept and divert surface water to a suitable outfall as per standard details.
- Excavators will strip and excavate an area for construction of the access track

leading to the borrow pit.

- Within the fenced area excavators will strip the peaty topsoil and form a stockpile locally for later use in reinstatement. Some peat is present at the site and the top layer of excavated peat (the acrotelm) will be removed separately from the bulk excavation and will be used to cap the material deposited in the borrow pits. This will be followed by separate excavation of any unsuitable overburden materials. If present, the latter will be stockpiled for use in reinstatement.
- Rock will be excavated from within the borrow pit and will be transported by dump trucks for use in construction of access tracks and cranepads within the site. Excavation will be carried out initially by excavator digging buckets.
- A sump will be excavated at the low point of the excavation, draining any water from the excavated materials and aiding dewatering. Extracted water will be required to pass through suitable silt treatment before passing through constructed outfalls.
- Cut-off drains will be installed around all stockpiles of materials to allow treatment of run-off water prior to passing through constructed outfalls.
- The sides of the excavations will be battered back to a suitable angle of repose to be determined by the nature of the rock present. Regular examination of these batters will be carried out to ensure there is no risk of collapse. There will be no pedestrian access permitted into borrow pits.

Most of the chosen locations all have a sloping surface profile and each borrow pit will comprise an excavated face tapering to a maximum of up to approximately 7 m in height. In this way they will incorporate a suitable gradient in the direction of the existing gradient, thereby minimising alterations to the natural drainage pattern of the area and avoiding deep below-ground excavations.

Development of the borrow pits will be on an as-needed basis during the construction phase. There will be no significant stockpiling of materials and it is envisaged that the volume of material available at any time will not exceed 2,000 t. The borrow pits / repositories will not entail washing and screening and no process water will be used in the operations.

3.7.2 Method of Rock Extraction

Stripping of the borrow pit area is expected to generate minimal noise due to the soft nature of the peaty topsoil and overburden material. The plant involved will include excavators and dump trucks. The material removed during this process will be stockpiled locally for use in reinstatement. This material can be placed to form a buffer to the down slope side of the excavation.

It is expected that a 30-40 t capacity excavator and a smaller 25 t capacity excavator will be utilised in tandem in the extraction of rock from the borrow pits. The larger excavator will extract rock from the face and floor of the excavation using digging buckets and rock rippers. It will be assisted by the smaller excavator, removing rock as it is broken, stockpiling locally within the excavation as well as loading dump trucks removing rock as required for distribution within the site.

The larger excavator may require the use of a hydraulic rock breaking attachment should the rock present prove to be too difficult to remove using a digging bucket alone. This plant attachment is similar to that commonly seen in breaking of pavements at roadworks.

It is unlikely that a rock crusher will be required.

3.7.3 Methodology for Reinstatement / Repository

The following general methodology will be employed in reinstating the borrow pits and using them as repositories:

- Excavated materials that are surplus to backfill requirements and are deemed unsuitable for reuse in construction will be brought to the repository locations. In addition to the unsuitable materials generated during excavation for track construction, this will include material that arose in the initial borrow pit clearance works.
- Excavators will level this material in suitable layers and compact it by tracking. Dead rolling may be carried out if the material is suitable. Initially, material will be used to fill the excavated void where rock had earlier been extracted. Where a further volume of materials generated during the access track, base and hardstand excavations requires to be permanently stored on site, surrounding berms will be constructed to increase the storage capacity. Details are presented on the project drawings, showing the berm arrangement for retaining excavated materials at the repositories.
- 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 above method of reinstatement has been successfully applied at other wind farm developments.

Three of the borrow pits will be used for rock extraction only. Restoration will carried out by landscaping surplus excavated material and covering with a vegetative peat layer, at a gentle slope to minimise the visual impact.

3.8 TREE FELLING

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 site.
- The outer perimeter of all buffer and exclusion zones.
- All health & safety issues relating to the site.

3.9 ACCESS

3.9.1 Turbine Delivery

For turbine delivery via Ballyvourney the temporary bridge over the Sullane River will be a proprietary product.

While the make and model to be deployed will be determined by the Contractor, it will have a proven track record of successful installation and removal at equivalent locations.

3.9.2 Public Roads

It is recognised that the public roads used in delivery of construction materials and turbine components will require upgrading to facilitate the project. Any road improvements that are undertaken will ultimately be of long-term benefit to the local community.

It is proposed that a joint condition survey of public roads be carried out for agreement with Kerry County Council prior to commencement of the project to identify any improvement works, such as road widening at bends, provision of passing bays, etc., that may be required.

The surface of the public roads will be maintained for the duration of the works and following completion of the construction the above survey will form a basis for agreeing any remedial works that may be necessary.

Road and bridge survey

3.10 COOMATAGGART 110 kV SUBSTATION

The permitted Coomataggart Substation will include plinths to support electrical equipment including transformer cable ducts, etc. The compound will be enclosed with a security fencing on which warning, project description and interpretation signage will be attached.

The three 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.

There are no planned construction activities that could be considered abnormal or complex in the context of civil and building construction projects. The major elements will comprise the following:

- Site clearance involving stripping of topsoil from construction areas.
- Earthworks to achieve a flat working area for the compound
- Installation of surface water drainage pipework.
- 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.

Installation of 110 kV transformers within impermeable bunds and all other high voltage (HV) equipment.

- Wiring and cabling of HV equipment and protection and control cabinets.
- Commissioning of all newly installed equipment.

3.11 GRID CONNECTION

Construction will entail both civil works and electrical works elements.

The civil works will comprise trench excavation and placing of HDPE cable ducts on a bed of cement bound granular material, as shown in Figure 3.5. The ducts will be surrounded in similar material and a cable warning slab will be placed on top. Ducts for communications ducts will also be installed. The remainder of the trench will be backfilled and the appropriate resurfacing of the road will be carried out.

The cable ducts will be installed above a watercourse structure where sufficient depth (850 mm or greater) is available above the crown or capping stone of a piped or stone culvert water crossing. Where the high voltage cables cannot be accommodated, it will be necessary to pass underneath the water course.

The crossing of streams and rivers will be carried out by open trench method or trenchless methods. 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 IFI. Where applicable, the construction will take place outside the salmon spawning period from October to April unless otherwise agreed.

In accordance with common practice, trenchless technology will be used to install cable ducting under wider watercourses where technically viable. Horizontal Directional Drilling (HDD) will be employed to construct the crossing of the various rivers / streams at the six locations listed below.

Table 3.4: Horizontal Directional Drilling Locations

Location	River	Description
S13	Garrane River	Entry/exit pits located in green field and unfarmed mountain locations,15 m from river edge.
S21	Foherish River	Entry/exit pits located in mid mature forestry locations, 20 m from river edge. Minor removal of forestry trees required
S43	Cappagh West River	Entry/exit pits located in grassland field locations, 20 m from river edge.
S44	Bohill River	Entry/exit pits located in grassland field locations, 30 m from river edge.
S49	Sullane River	Entry/exit pits located in grassland field locations, 20 m from river edge.
S67	Sullane River	Entry/exit pits located in unfarmed field locations, 15 m from river edge

Electrical works will commence when the underground cable ducts have been completed from joint bay to joint bay and tested. For electrical works drums of power cable will be brought to site on a suitable transporter, unloaded and positioned in line at the rear of the joint bay. A cable winch attached to an appropriate vehicle will be positioned at the next joint bay location and the power cable will be pulled through the ducting using a steel wire and the cable winch. Once fully installed the electrical circuit will then be commissioned.

Full details of the construction of the underground cable are presented as Appendix C.1 in Volume 2 of 3 of the EIS.

3.12 CONSTRUCTION WASTE

All wastes will be managed in accordance with applicable legislation and recognised best practice within the construction industry. Burning or burying of waste or packaging materials will not be allowed on site at any time.

The main items of waste that will arise during the construction phase and their sources are set out in Table 3.5.

Table 3.5: Construction Waste and their Sources

Waste	Source
Canteen and office waste	Staff welfare facilities and site offices
Hardcore, stone, gravel, waste, and concrete	Temporary surfaces to facilitate construction
Concrete blocks and miscellaneous building materials	Left over from construction of the control building and temporary office accommodation
Timber	Temporary supports, shuttering and product deliveries
Steel	Steel that is unused in reinforced concrete structures
Lubricating Oils, Diesel	Unused quantities at end of construction period

Waste materials will be dealt with as follows:

- Non-hazardous Office & Canteen Waste: A licensed waste disposal contractor will transport this waste to a licensed landfill.
- Construction Waste: This waste will be stockpiled on site and will be transported to a licensed landfill for final disposal.
- Steel: All waste steel reinforcing bars will be stockpiled. Unused material may be gathered for reuse elsewhere and scrap items will be collected for recycling by a scrap metal merchant.
- Timber: Timber waste will be minimised through reuse of shuttering, etc. throughout the project. At completion it is expected that the majority of timber will be gathered for reuse elsewhere at a different site.
- Fuel, Oils and Hydraulic Fluids: Waste will be stored on site in labelled containers and will be collected by a licensed oil recycling contractor as necessary.
- Electrical Waste: All electrical waste will be stored on site in labelled containers and will be collected by a licensed recycling contractor as necessary.

Appropriate waste management records will be maintained.

3.13 REINSTATEMENT

The process of backfilling the excavated soil and restoring surface vegetation along access track margins, over the margins of hardstanding areas, etc., will commence as soon as the imperative tasks in the construction process are complete.

Some overburden material will be stored temporarily adjacent to the works areas for reinstatement when the main construction activities are completed. The working area around each turbine will be backfilled on completion of the turbine foundation. Similarly, access tracks will be graded back to the level of the adjacent ground.

Soil will be backfilled outside the drainage channels along track-sides and vegetated sods replaced over the surface, bedded-in, regraded, etc., to re-constitute a stable and settled ground surface on which the natural vegetation can recover and will be resistant to erosion.

3.14 MITIGATION OF IMPACTS

Incorporation of measures to mitigate environmental impacts is inherent in the planning and design of wind farms such as Grousemount Wind Farm. This extends to all phases of the wind farm project from site selection and the concept phase, including consideration of alternatives, through development pre-planning and design phases to construction, operation and decommissioning.

The hierarchy in mitigating environmental impacts in the Grousemount Wind Farm project has been avoidance, reduction and remedy. The objective of the development has been to maximise the sustainable wind energy capture of what is a very suitable site for wind energy development without causing significant adverse environmental impacts. The design of Grousemount Wind Farm meets the primary objective of avoidance of impacts on environmental resources.

A consideration in all projects is to minimise the scope of project activity necessary to achieve the project objectives in a manner that is environmentally responsible. At Grousemount impacts on all aspects of the environment have been minimised by selection of the proposed scheme over the multiplicity of possible alternatives.

In particular, the results of significant geotechnical investigations have been utilised to develop a layout that can be safely constructed and minimises impacts on the most valuable habitats at the site.

Key mitigating actions during design, construction and operation of the wind farm include the following:

- Design of foundations for the wind turbines will be undertaken by qualified structural engineers who have successfully designed foundations for wind farm developments in similar environments.
- A full construction management team will be deployed on site in accordance with routine site construction procedures. This team will consist of a Resident Site Manager and Assistant Engineers as appropriate.
- All construction works will be carried out under appropriate supervision. Works will be carried out by experienced contractors using appropriate and established safe methods of construction. All requirements arising from statutory obligations, including the Safety, Health and Welfare at Work Act and associated regulations, will be met in full.
- ESB has had a long history of responsible operation of power plants throughout Ireland and is mindful of its obligations in regard to environmental protection.

3.15 SCHEDULE

3.15.1 Wind Farm

The wind farm installation will require about 18 months to complete, provided that conditions are not unfavourable. Distinct or separate phases of the project are not planned since it is intended that all turbines will be installed in one phase.

An indicative construction schedule is presented in Figure 3.6 and nominal time scales for construction works are typically as follows:

- Civil engineering works will take approximately 12 months.
- Electrical works will take approximately 12 months and will be carried out in conjunction with the civil works as far as possible.
- Turbine erection will take approximately 6 months and will commence when the bulk of the civil works are complete.
- Final reinstatement will be conducted in parallel with turbine commissioning.

The final programme will be developed in consultation with the turbine manufacturer, based on availability of turbines and projected delivery dates.

3.15.2 Coomataggart Substation

Timely completion of Coomataggart Substation will be a critical issue in delivery of the full project. Its construction will commence immediately following site mobilisation.

3.15.3 Grid Connection

Typically, the rate of progress for a construction crew laying cable ducts would be approximately 50 - 70 m of trench in a roadway per day, depending on the site conditions. Given the length of the proposed route, it is anticipated that at least two construction crews could work in parallel on the grid connection, leading to a work duration estimate of approximately 12 months.

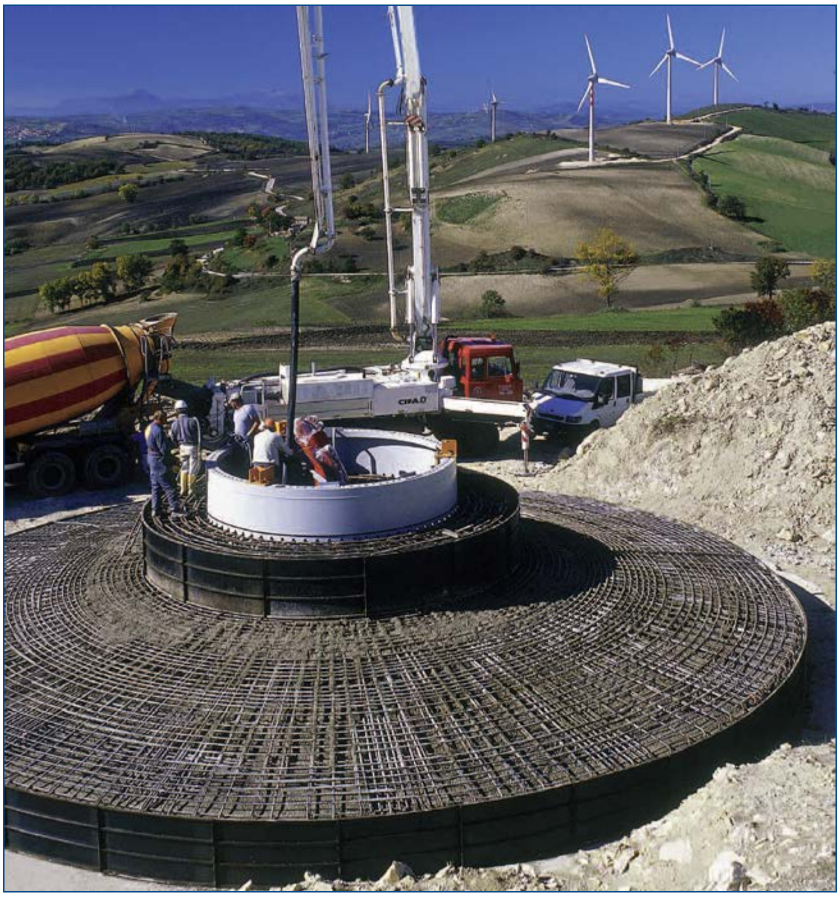

Figure 3.1: Wind Turbine Foundation

Figure 3.2: Crane for Wind Turbine Erection

Figure 3.3: Assembly of Wind Turbine Blades

Figure 3.4: Wind Turbine Erection

Figure 3.5: Typical 110 kV Cable Installation

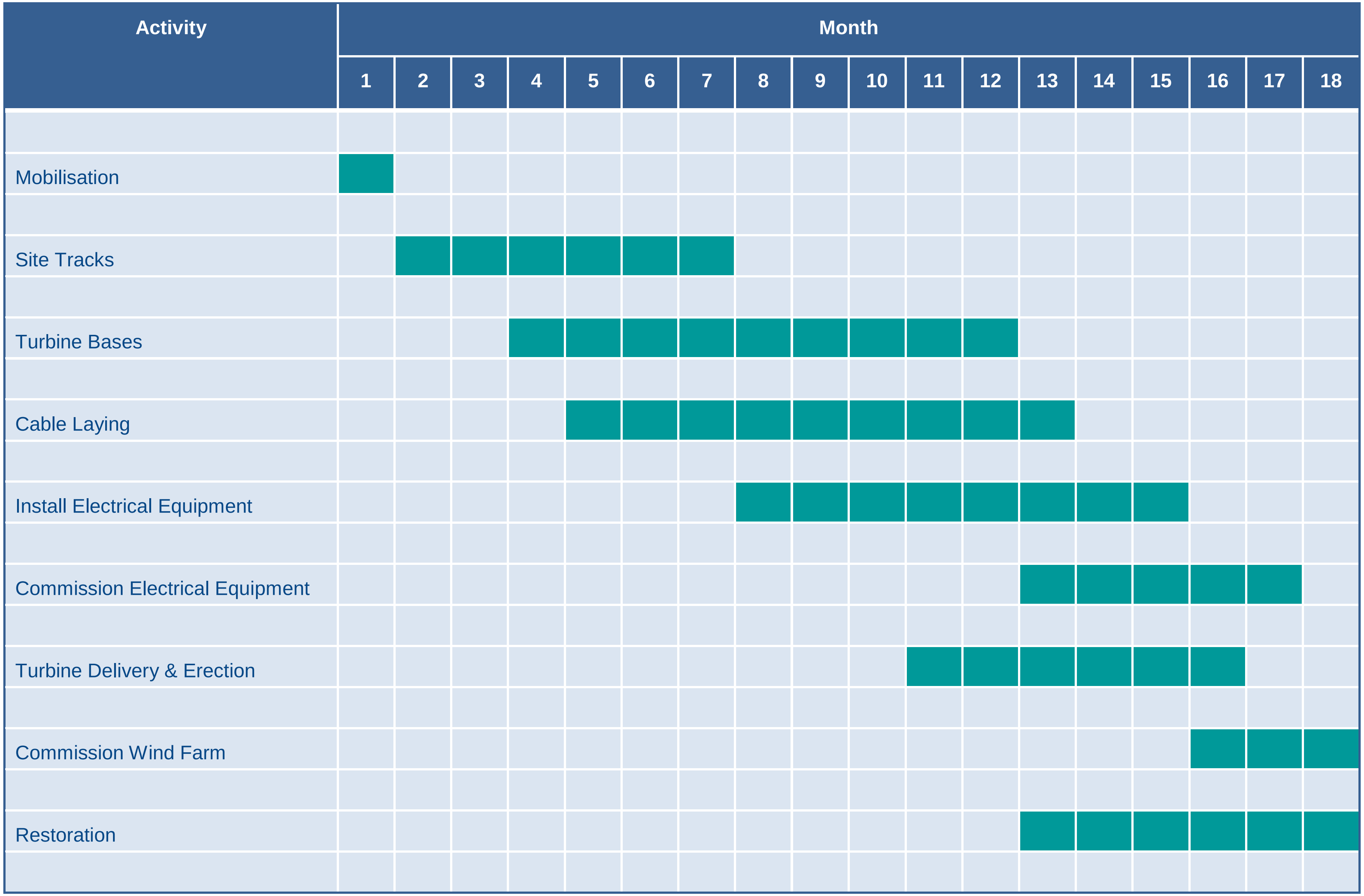

Figure 3.6: Wind Farm Construction Schedule