Drumdowney Substation and Grid Connection

Site Access Report

December 2025

CIVIL AND STRUCTURAL
ENGINEERING ADVISORS LTD.

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County Kilkenny

Client:	Drumdowney Solar Farm Ltd.					
Project Title:	Drumdowney Substation and Grid Connection					
Document Title:	Site Access Report					
Document No:	CAS011_27ARP001					
This Document Comprises:	**DCS**	**TOC**	**Text**	**No. of Appendices**	**List of Figures**	**List of Tables**
	1	1	30	2	-	-

Rev.	Status	Author(s)	Reviewed By	Approved By	Issue Date
A01	Approval	KR	MK	KR	07.12.25
F01	Final	KR	MK	KR	15.12.25
F02	Final	KR	MK	KR	17.12.25

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1 INTRODUCTION

Civil and Structural Engineering Advisors Ltd. is providing engineering consultancy services to Drumdowney Solar Farm Ltd. in relation to *Drumdowney Substation and Grid Connection*. This is a Site Access Report for the proposed development.

The proposed development comprises of

1. A 110kV Gas Insulated Switchgear (GIS) electricity substation with two-storey GIS substation building, single-storey Independent Power Producer (IPP) control room building, High Voltage (HV) electrical equipment and associated infrastructure (to include transformer, lightning protection masts, back-up diesel generator, fire/blast wall, telecoms pole, perimeter security fencing, security lighting, water and drainage infrastructure, and temporary construction compound) to connect to and serve a solar farm;

2. Associated loop-in / loop out infrastructure to connect into an existing 110kV overhead transmission line (including underground 110kV cabling, 2 No. new interface towers and decommissioning of ca. 15m of existing 110kV overhead line);

3. Construction and operational access from the public road L34142;

4. All ancillary site development, landscaping and earthworks. The development subject to this application forms part of grid connection and access arrangements which will facilitate the connection of the proposed Drumdowney Solar Farm (Kilkenny County Council Reference 25/60391) to the national grid. A Natura Impact Statement (NIS) has been prepared in respect of the proposed development. The NIS includes consideration of the proposed Drumdowney Solar Farm which is located in the townlands of Atateemore or Blackneys, Ballyhobuck, Ballyrahan, Carriganurra, Charlestown, Davidstown, Drumdowney Lower, Drumdowney Upper, Gorteens, Grogan, Kilmurry, Nicholastown, Rathpatrick, Scartnamoe, Tinvaucoosh and Treanaree in County Kilkenny.

The operational lifetime of the solar farms is assumed to be 40 years. However, following the decommissioning of the solar farm, it is envisaged that the substation (and underground cable grid connection) will remain in situ as a valuable functioning and operational part of the electricity transmission network managed by the Transmission Systems Operator, EirGrid.

The purpose of this report is to consider the proposed development from an access and transportation perspective. The report is presented in the following sections to allow a detailed engineering appraisal of the local road network in relation to proposed construction and operational traffic:

- The proposed development, the site and its context in the local road network.
- Existing and anticipated traffic.
- Delivery routes and *Swept Path Analysis*.
- Vertical and horizontal road geometry.
- Pavement and roadside drainage.
- Sightline appraisal at proposed entrances.
- Proposed mitigation measures.

2 THE PROPOSED DEVELOPMENT

2.1 GENERAL

The proposed development comprises:

1. 110kV Gas Insulated Switchgear (GIS) electricity substation with two-storey GIS substation building, single-storey Independent Power Producer (IPP) control room building, High Voltage (HV) electrical equipment and associated infrastructure (to include transformer, lightning protection masts, back-up diesel generator, fire/blast wall, telecoms pole, perimeter security fencing, security lighting, water and drainage infrastructure, and temporary construction compound) to connect to and serve a solar farm;

2. Associated loop-in / loop out infrastructure to connect into an existing 110kV overhead transmission line (including underground 110kV cabling, 2 No. new interface towers and decommissioning of ca. 15m of existing 110kV overhead line);

3. Construction and operational access from the public road L34142;

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The operational lifetime of the solar farms is assumed to be 40 years. However, following the decommissioning of the solar farm, it is envisaged that the substation (and underground cable grid connection) will remain in situ as a valuable functioning and operational part of the electricity transmission network managed by the Transmission Systems Operator, EirGrid.

2.2 SUBSTATION

The substation will be based on EirGrid design specifications. The substation compound will consist of a two-storey GIS substation building, single-storey IPP Control Room building, HV electrical equipment and associated infrastructure including palisade fences and concrete post and rail fences. The installation of HV electrical equipment will include a transformer with associated equipment along with:

- Lightning Masts (LM);
- Back-Up Diesel Generator;
- Harmonic filters if required by EirGrid;

- Capacitor Bank if required by EirGrid;
- Fire/Blast Wall;
- Telecoms Pole.

The substation compound has a total area of 5,335m^2.

Earthworks will be undertaken so the compound is level, with a finish compound level of 91.65mOD.

2.3 SITE ACCESS

The site will be accessed for both the construction and operational phases by means of a single entrance from the L34142. This existing entrance will be subject to some upgrades, including removal of existing roadside sod and stone ditch to provide new gate as presented under Kilkenny County Council Reference 25/60391 (Drumdowney Solar Farm). The entrance will be suitably splayed and has been subject to sight line and autotrack analysis, with the latter including modelling of abnormal load delivery for the transformer. Operational sightlines will be maintained by trimming back hedgerows with all necessary land within ownership.

A 4.5 metre wide compacted access track will extend from the entrance to the substation compound. The design includes a temporary construction track to cater for deliveries, which will be decommissioned post the construction phase (and land reinstated), as well as an operational access track. The track will include a geotextile base and filter membrane and 200 mm of Clause 804 sub-base.

2.4 CONNECTION TO NATIONAL GRID

In order to connect to the transmission network, it is proposed to connect the 110kV substation into the national grid via a 'loop-in / loop-out' underground 110kV cable grid connection which will connect into the existing 110kV Great Island to Waterford overhead line.

Two new steel lattice interface towers of approximately 16 m in height will form part of the existing overhead line and both towers will connect to the proposed 110kV substation via underground 110kV cables. The interface towers are approximately 15 metres apart, therefore the same length of the existing 110kV Whitegate – Cow's Cross overhead line will need to be decommissioned. The underground cable is comprised of 3 no. power ducts, 2 no. telecom ducts and 1 no. earth continuity duct. The cables to each interface tower are 68 and 83 metres in length.

This connection method will constitute a new node of the transmission network, connecting the proposed substation and associated solar farm generation to the national electricity grid. The construction method for the interface towers and decommissioning of 110kV overhead lines is set out in the Drumdowney Substation & Grid Connection Construction Methodology prepared by Drumdowney Solar Farm Limited.

All works will be carried out in accordance with international best practice and full compliance with health and safety requirements. It is noted that the proposed grid connection is located entirely on private lands and there is no grid connection works proposed in public roads.

2.5 TEMPORARY CONSTRUCTION COMPOUND

As outlined in the submitted site layout plans, it is proposed to provide a temporary construction compound west of the proposed substation, accessed from the entrance from the L34142. The temporary compound will include the following facilities at a minimum:

- Adequate canteen space to allow for all workers during the peak period;
- Office space with lighting, heating and internet facilities;
- Toilets and adequate welfare facilities for construction staff in accordance with the relevant statutory Health & Welfare guidelines;
- Parking space for both light and heavy vehicles;
- Designated skips and temporary storage areas.

2.6 SURFACE WATER DRAINAGE AND WATER SERVICES

Surface water drainage proposals for the development have been developed to mimic the natural drainage patterns of the site and thereby be in accordance with the best management practices of Sustainable Drainage Systems (SuDS) including those set out in the SuDS Manual (C753) published by CIRIA in 2015. Specifically, this includes the following:

- The compound construction is formed with permeable stone thus mimicking a soakaway scenario. ESB compound stone is single sized for the first 150mm for safety purposes. It then changes to a graded 6F2 material.
- The main areas to be drained includes the roofs and the compound road. These equate to approximately 2359m^2. The compound road will be drained via series of road gullies.
- Assuming even the most basic of infiltration rates down through the permeable compound stone, the existing greenfield situation is easily maintained.

The surface water generated in the hardstanding and bunded areas will discharge to the soakaway via a Class 1 Full Retention Oil Separator. The electrical transformer in the substation is oil filled equipment and, as such, is protected with impermeable bunds. Surface water generated in this bund will be pumped out by an oil sensitive pump ensuring that only non-contaminated water enters the site drainage network.

In relation to wastewater, a 5m^3 foul holding tank is proposed as part of the operational development. These tanks are normally used in ESB substations. It will be emptied periodically, with the capacity in excess of modelled holding requirements.

It is proposed to provide the required potable water demand of the station with a bored well on site. The potable water demand within the site will be low as the proposed station is to be unmanned. To avoid issues like stagnation in the water supply line and problems resulting from this, there will be a continual water demand of 24 litres per week from automatically flushing WCs within the station.

2.7 SITE RESTORATION AND LANDSCAPING

This will involve the reinstatement of all other excavated materials and associated landscaping works. It will include the replacement of topsoil in disturbed ground areas such as access tracks and the removal of the construction compound and other temporary work areas.

The proposed landscaping provides for the removal of c.87 metres of hedgerow to facilitate the proposed development. Approximately 531 metres of existing hedgerow will be bolstered (Type 1) as part of the development, with an additional 287 linear metres of new hedgerow planting (Type 2) as per the submitted Landscape Mitigation Plan.

2.8 OTHER PLANNED WORKS

Kilkenny County Council Reference 25/60391.

It is intended that the proposed 110kV substation and grid connection will service the Drumdowney Solar Farm, which is currently the subject of a planning application to Kilkenny County Council. At the time of writing, the solar farm application is undetermined.

The proposed solar farm will consist of solar panels on ground mounted frames, 27 no. single storey electrical inverter/transformer stations, 5 no. single storey spare parts containers, 3 no. Ring Main Units, 5 no. weather stations, underground electrical ducting and cabling within the development site, private lands and within the L3429, L7523, L7563, L7469, L3407, L3414, L34144, L7466, L3406, L7483, L3415, N25 and N29 public roads to connect solar farm field parcels, security fencing, CCTV, access tracks, 7 no. watercourse/drain deck crossings and 4 no. horizontal directional drill crossings (under the N25 and N29 public roads and the Luffany River), temporary construction compounds, landscaping and all associated ancillary development and drainage works. Construction and operational access will be via 7 no. existing entrances from the L3429, L7469, L7466, L4783 and L34142 which will be subject to entrance upgrade works. Separate construction phase access options are proposed for Parcel 4 via Port of Waterford and the L4783. The operational lifespan of the solar farm will be 40 years.

The solar farm will contribute directly to a carbon dioxide emission reduction of 41,647 tonnes per annum or the equivalent of approximately 1,665,917 tonnes of CO2 over the 40-year lifetime of the project.

2.9 CONSULTATION

Consultation with the Planning Authority regarding roads issues has been undertaken to date and is summarised in the table below.

Date	Consultation Type	Council Department / Lead Contact	Consultation Topic
27/5/25	Telephone and email	Roads Mr. Owen Shine	General scheme overview. Modifications to scheme proposals resulting from earlier meeting with Planning Department. 33kV cable interconnector crossing the N25 Glenmore to Waterford Preferred Route Corridor; Access routes and cable trench details.

3 THE SITE AND CONTEXT

3.1 SITE LOCATION

The site is located in County Kilkenny at Latitude 52.288185 N and Longitude 7.057623. The site is approximately 6.5km north east of Waterford. Figures 3.1 shows the location of the site. The site is accessed from the adjacent N25 and N29 via local roads. Figure 3.2 shows a plan of the proposed substation site.

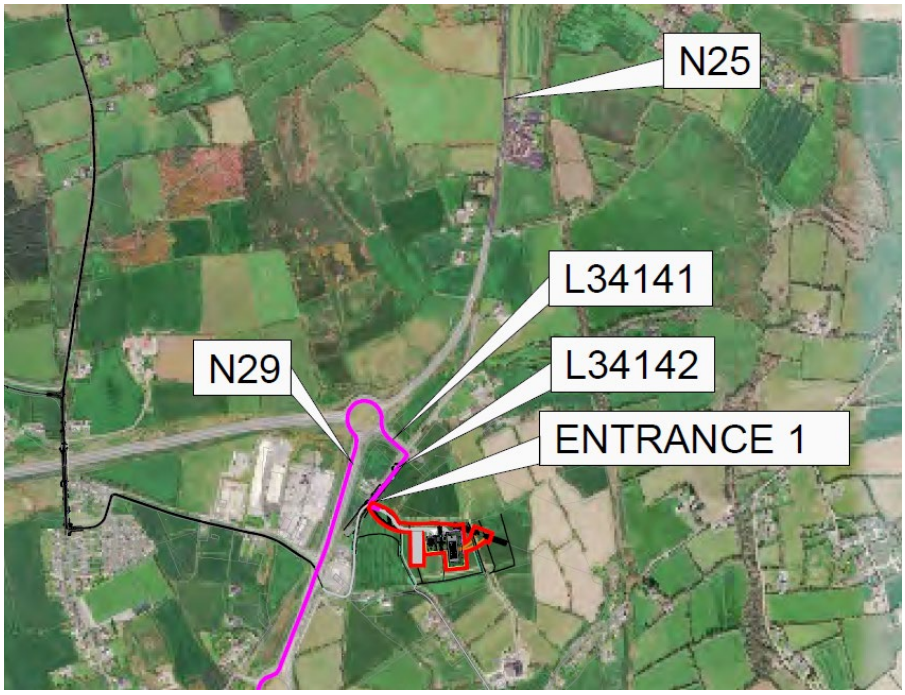


Figure 3-1: Site Location (RLB) with Principal Access Route

3.2 ROAD NETWORK IN THE VICINITY OF THE SITE

The site is well served by the national and local road network. The site is located adjacent to the N25 and N29 national roads east of Waterford. The substation site is accessed via the N25/N29 junction and the local roads L34141, and L34142. Figure 3.4 shows the road network in the vicinity of the site. The road geometry, pavement condition and drainage of the local roads are considered in Sections 6 and 7 of this report.

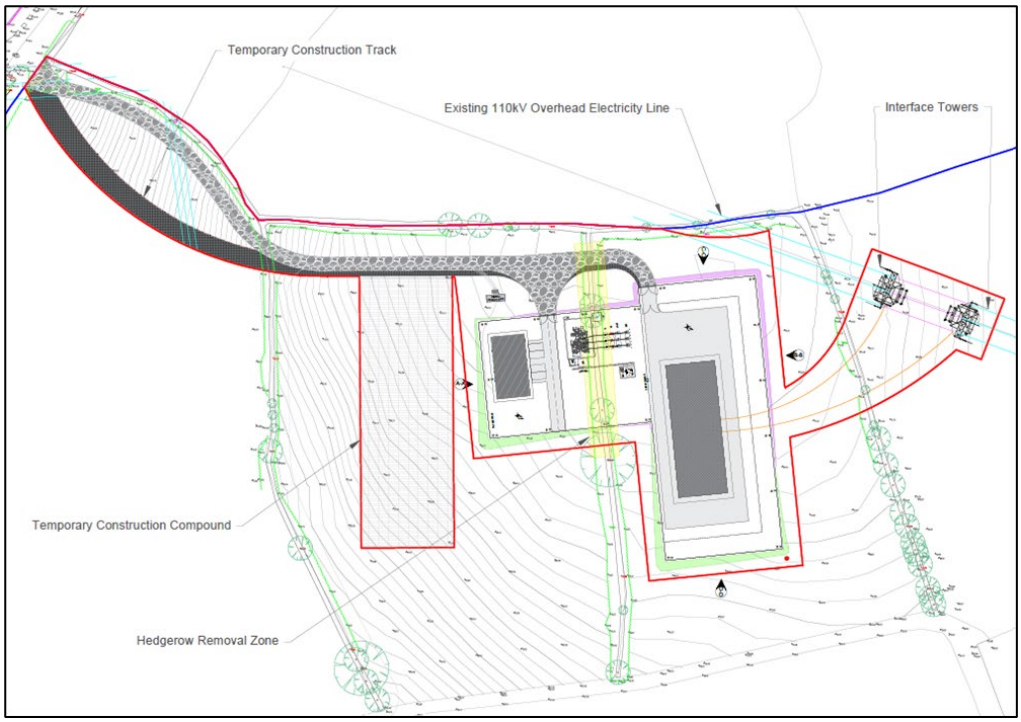


Figure 3-2: Proposed 110kV GIS Substation

Figure 3-3: Site Entrances and the Road Network in Vicinity of the Site

3.3 PROPOSED SITE ENTRANCE

One site entrance is proposed. It is an existing field entrance. The entrance is:

- Entrance 1 is an existing entrance on the L34142 local road and provides access to the substation site.

The location of the proposed site entrances are provided in Figure 3-3 and an image of the site entrance is provided in Figure 3.4. A video of the site entrance is available for downloading at the link provided in the footnote[1].

Figure 3-4: Site Entrance 1

3.4 TOPOGRAPHY AND LAND USE

The land use in the area of the proposed substation is generally agricultural with the exception of the land to the south and west of the site which is commercial land and port land. The topography of the land is characterised by gentle slopes. There are no significant inclines nor other topographical features impacting on the current road geometry which is free of steep gradients and hairpin bends.

[1] A video of proposed entrance is available here: https://ln5.sync.com/dl/5e5402930/xadfhx6t-t5dy94ei-ca89dsed-iyx5mhnx

4 TRAFFIC

4.1 PROGRAMME

The construction of the substation and solar farm will be undertaken contemporaneously. For the purposes of worst case and cumulative traffic impact assessment, both the solar farm and the substation and grid connection development are considered in this report. The solar farm construction includes the installation of PV arrays, prefabricated inverter/transformer stations, storage containers, access track and bridge crossings, cable trenches, fencing, CCTV etc and all associated development works. There are 4 no. district field parcels or solar arrays associated with this solar farm. Construction of the solar farm within each parcel will take approximately 3-5 months with activities overlapping and construction resources shared on individual land parcels, as required. It is expected that the overall programme for construction of the solar farm and substation/grid connection will be 24 months. The construction traffic will be broadly spread over the construction programme. It is hoped that the solar farm can be energised by 2028 in order to contribute to Ireland's 2030 climate and renewable energy electricity targets.

4.2 ANTICIPATED TRAFFIC

The construction of Drumdowney Solar Farm and substation is expected to take c. 24 months in total. A detailed breakdown of the principal construction phase activities and their associated construction vehicle (HGV) trips is provided in Table 4.1 overleaf.

Over the 24-month period, the average number of HGV vehicles is 10 per day. A 5.5-day week is assumed as per normal construction projects. The peak number of HGV trips is 21 per day with an hourly average of 2.6. This peak activity is associated with civil engineering works in months 1 to 3 and solar farm set-up and installation works in months 7 to 19. Vehicle trips reduce substantially in the final months of the programme. Measures to mitigate the temporary construction traffic on the local road network is described in Section 9. On completion of the works and commissioning of the solar farm, it will be an unmanned facility which will be remotely monitored. Operational and maintenance activities in relation to the solar farm will generate occasional vehicle trips, estimated at 2 – 4 van or tractor/trailer type vehicles per month.

As noted below, on commencement of solar farm construction, there is a general reduction in agricultural traffic in the roads surrounding the solar farm parcels as the land activity is changed from agriculture to low-maintenance energy generation. Sequencing solar farm and substation works at construction stage will form part of the developed traffic management proposals to minimise impact on local communities.

4.3 DETAILED ASSESSMENT OF CUMULATIVE IMPACT OF SOLAR FARM, SUBSTATION AND GRID CONNECTION TRAFFIC

The detailed, granular, breakdown of HGV traffic that informed the summary programme provided in Table 4.1 is provided in Appendix B. Individual construction activities have been itemised together with associated work activities, durations, materials quantities and associated vehicle movements to and from site. The itemisation of these activities has been informed by a comprehensive analysis of construction activities, engineering calculations and engagement with construction contractors and considers:

Solar Farm including 33kV cabling	**110kV Substation and Grid Connection**
• Machinery Mobilisation (machine number); • Number of Panels;	• Transformer • Substation Import/Export • Total HGV Import/Export

• Mounting System; • Inverter/transformers, Spare Part containers, battery containers, RMUs; • Inverter/transformer Foundations; • Length of Fencing (m); • Area of access tracks (m2); • Area of construction compound (m2); • Length of AC cable trenches (Varied Width); • Length of DC cable trenches; • AC cabling (cable length); • DC cabling; • Ducting; • Welfare facilities within compound; • Machinery demobilisation.	• Concrete • Offices • Fencing • Electrical Equipment • Cable Drums • Joint bays • Building Blocks • Roof Joists • Miscellaneous Deliveries

It should be noted that the Applicant is committed to ensuring that the final Contractor-led traffic calculations are advised to Kilkenny County Council prior to the commencement of development. At that stage of the project, the Applicant proposes to prepare a detailed Construction Traffic Management Plan for the review and approval of Kilkenny County Council. The Applicant would welcome any associated planning conditions relating to same, which is considered standard of applications of this nature.

4.4 TRAFFIC ASSOCIATED WITH EXISTING LAND USE

The land parcels forming the proposed solar farm site currently comprise of working farms. The estimated existing traffic associated with agricultural activity at the site is detailed in Table 4.2. This information was derived from recent interviews with the farmers currently working the solar farm and substation sites. The table shows return trips to the farms over a 52-week period. The total number of return trips in this period amounts to 1,655 per annum, or 31 per month (averaged over the 12-month period). After a temporary increase in traffic numbers during the construction phase, the absence of agricultural vehicles from the local road network will result in a reduction of traffic on the network. The monthly average return trips are expected to drop from the current 31 return trips to a maximum of 4 trips per month during the solar farm's operational phase.

Table 4-1: Construction Programme and Construction Vehicle Numbers

	Estimated Construction Programme & Vehicle Numbers																							
		Construction Programme (Months)																						
	Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**0**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Substation Construction	Enabling Works	250	250	250																					
	Civil Works				20	20	20	20	20	20	20														
	Electrical Works											20	20	15	10	5									
Grid Connection Construction	Civil and Electrical Works													137	138	138	138								
Substation Electrical Commissioning	Pre-commissioning																								
	ESB Commissioning																								
Solar Farm Construction	Solar Farm Site Set Up & Installation							323	440	235	287	99	99	99	202	112	112	301	301	298	22	22	4	96	71
Solar Farm Electrical Commissioning	Electrical Commissioning																					100	100	80	
	Close Out																							80	80
	Estimated Vehicles Per Month	**250**	**250**	**250**	**20**	**20**	**20**	**342.9**	**459.6**	**255.4**	**307.4**	**119.2**	**119.2**	**251.2**	**349.6**	**255.5**	**250.5**	**300.6**	**300.6**	**298**	**22.05**	**122.1**	**104.2**	**256.1**	**151**
	Estimated Vehicles Per Week	**62.5**	**62.5**	**62.5**	**5**	**5**	**5**	**85.72**	**114.9**	**63.84**	**76.84**	**29.81**	**29.81**	**62.81**	**87.4**	**63.86**	**62.61**	**75.15**	**75.15**	**74.49**	**5.513**	**30.51**	**26.05**	**64.02**	**37.7**
	Estimated Vehicles Per Day (5.5 days)	**11**	**11**	**11**	**1**	**1**	**1**	**16**	**21**	**12**	**14**	**5**	**5**	**11**	**16**	**12**	**11**	**14**	**14**	**14**	**1**	**6**	**5**	**12**	**7**
	Peak Daily Vehicles	**21**																							
	Peak Hourly Vehicles	**2.625**																							
	Average Daily Vehicles	**10**																							
	Average Hourly Vehicles	**1**																							

Table 4-2: Traffic Associated with Existing Agricultural Use

Drumdowney Solar Farm - Existing Traffic Associated with the Solar Farm and Substation Development Site

	Activity	Vehicle Type	Farm A	Farm B	Farm C	Farm D	Farm E	Farm F	Total Trips (52 weeks)
1	Ploughing	4-wheel tractor and plough	4	1	9	0	2	2	**18**
2	Cultivating	4-wheel drive tractor, trailer and attachments	6	1	21	4	0	80	**112**
3	Harvesting	4-wheel drive tractor, trailer and attachments	160	27	36	40	1	70	**334**
4	Extraction	wheel drive tractor, 20 tonne twin axle truck and loading shove	65	0	20	0	0	10	**95**
5	Spraying	4-wheel drive tractor with spraying attachments	4	44	12	3	0	6	**69**
6	Slurry Spreading	4-wheel drive tractor with slurry tanker	50	27	66	250	2	100	**495**
7	Milk Collection	Articulated Lorry	0	0	0	150	0	200	**350**
8	Bulk Deliveries	Articulated Lorry	11	0	42	35	0	50	**138**
9	Animal Movemer	4-wheel drive tractor, trailer and attachments	0	24	10	0	0	0	**34**
10	Vet Visits	Car or Van	0	0	10	0	0	0	**10**
								Total	**1655**

The information provided in this chapter and Table 4.1 above concerns construction vehicles such as 4-axle gravel delivery lorries, articulated HGV's for plant and materials deliveries etc. These vehicles have the most impact on the network given their general dimensions and axle loads. The development site of the combined solar farm and substation is large comprising several discrete land parcels. This construction traffic will be distributed across the land parcels and will not be concentrated in one specific local area or one local road. These traffic volumes will be spread across the site and the applicant will work closely with Kilkenny County Council to ensure there is minimum local disruption experienced in the community.

Traffic associated with site staff driving their own cars to site is dealt with separately to HGV traffic. Staff will access the site using light vehicles (cars/mini-buses), and car parking facilities will be available on site to ensure that traffic flows on the local road network in the vicinity will not be impeded during construction. Car-pooling for staff will be encouraged for the duration of the project.

In relation to construction worker traffic, the volumes are modest given the large development site and associated road network. The peak number of construction workers is anticipated to be 180 (including the proposed substation site). It should also be noted that the construction phase will be temporary in nature and will be undertaken in accordance with a detailed traffic management plan to be agreed with Kilkenny County Council and An Garda Siochana. This traffic management plan will include advance signage in accordance with Chapter 8 of the *Traffic Signs Manual*, use of appropriate delivery routes, phasing of site traffic to minimise interference with school runs and the like and be designed, implemented and certified by traffic management professionals in line with current regulations.

A Construction Management Plan (*Drumdowney Substation and Grid Connection - Construction Methodology)* is provided with the application documents. Pending planning approval, this CMP will be developed further by construction contractors at detailed design stage in consultation with the Kilkenny County Council to ensure construction stage traffic is managed appropriately and with limited local impact.

5 DELIVERY ROUTE AND SWEPT PATH ANALYSIS

5.1 PROPOSED DELIVERY ROUTE FOR SUBSTATION AND GRID CONNECTION

It is proposed that the development site be accessed via the N29 and N25 national roads and the local road junctions close to the proposed site entrance. It is anticipated that substation components including the transformer will be imported via the Port of Waterford at Belview. Figure 5.1 shows the proposed delivery route to the substation site. A *Swept Path Analysis* of the proposed routes showed no difficulties for the largest delivery vehicle proposed for the construction stage of the development. Appendix A of this report includes a ***detailed suite of drawings*** showing the *Swept Path Analysis* of the delivery routes. It is noted that the delivery routes presented here are proposed routes to site which reflect the technical reviews completed for the project to date. Further to any grant of permission, the final delivery routes shall be subject to agreement with Kilkenny County Council.

Figure 5-1: Proposed Delivery Route to Site (Large Scale Detail Drawings in Appendix)

5.2 VEHICLE TYPE – ABNORMAL FOR SUBSTATION CONSTRUCTION FOR SWEPT PATH ANALYSIS

As described in Section 5.1 above, a Swept Path Analysis of the delivery routes and site entrance has been conducted using specialist software (AutoTrack by AutoDesk). Swept Path Analysis is helpful to identify areas on vehicle routes where trailers overfly pavement edges when turning movements are being conducted. Such areas require consideration to ensure there are no obstacles present to obstruct vehicle movements. Temporary removal of roadside features such as utility poles and boundary fences is sometimes required to facilitate vehicle movements. The Swept Path Analysis of the delivery routes and site entrance is based on the largest vehicles likely to require access to the site during the construction phase of the proposed development. In this instance, there will be two abnormal load deliveries to the substation site, and the analysis has been undertaken for the specific proposed vehicle which is shown in Figure 5.2.

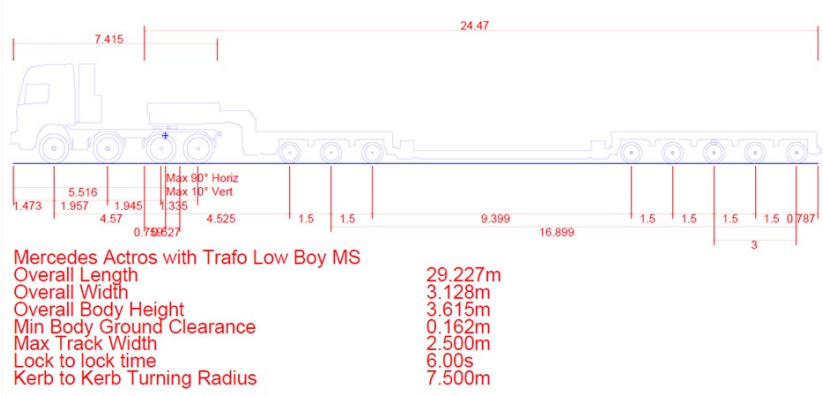


Figure 5-2: Swept Path Analysis Vehicle Type - Abnormal Load Vehicle

The Applicant is familiar with the requirements for Exceptional Abnormal Loads (EAL) introduced in 2024 and has specialist bridge engineers on its team to undertake structural assessments and the like. All the construction traffic for the solar farm will be *permitted vehicles* not requiring Abnormal Load Permits. For the two abnormal load movements proposed for the substation construction phase, the Applicant will comply fully with requirements in relation to the permitting and management of Exceptional Abnormal Loads at construction stage. The Applicant is proposing to bring these abnormal loads through Belview Port to absolutely minimise the journey on public roads. Most of the journey on public roads is via the N29 national road, a high-quality road with the final 300m on the L34141 local road. Both roads have been inspected by the Applicant's engineering team as part of the preparation of this report and no significant defects were observed. The Applicant notes the detailed requirements for extensive consultation with TII regarding the use of the N29 for the abnormal load deliveries for the proposed substation and these are addressed in Section 5.4 below.

5.3 SWEPT PATH ANALYSIS – SITE ENTRANCE 1 – L34142

The Swept Path Analysis of Site Entrance 1 is provided in Figure 5.4. This is an existing entrance. The analysis shows that the delivery vehicle can access and egress the site without the need for any works to the L34142. Sight lines are discussed in Section 8 of this report.

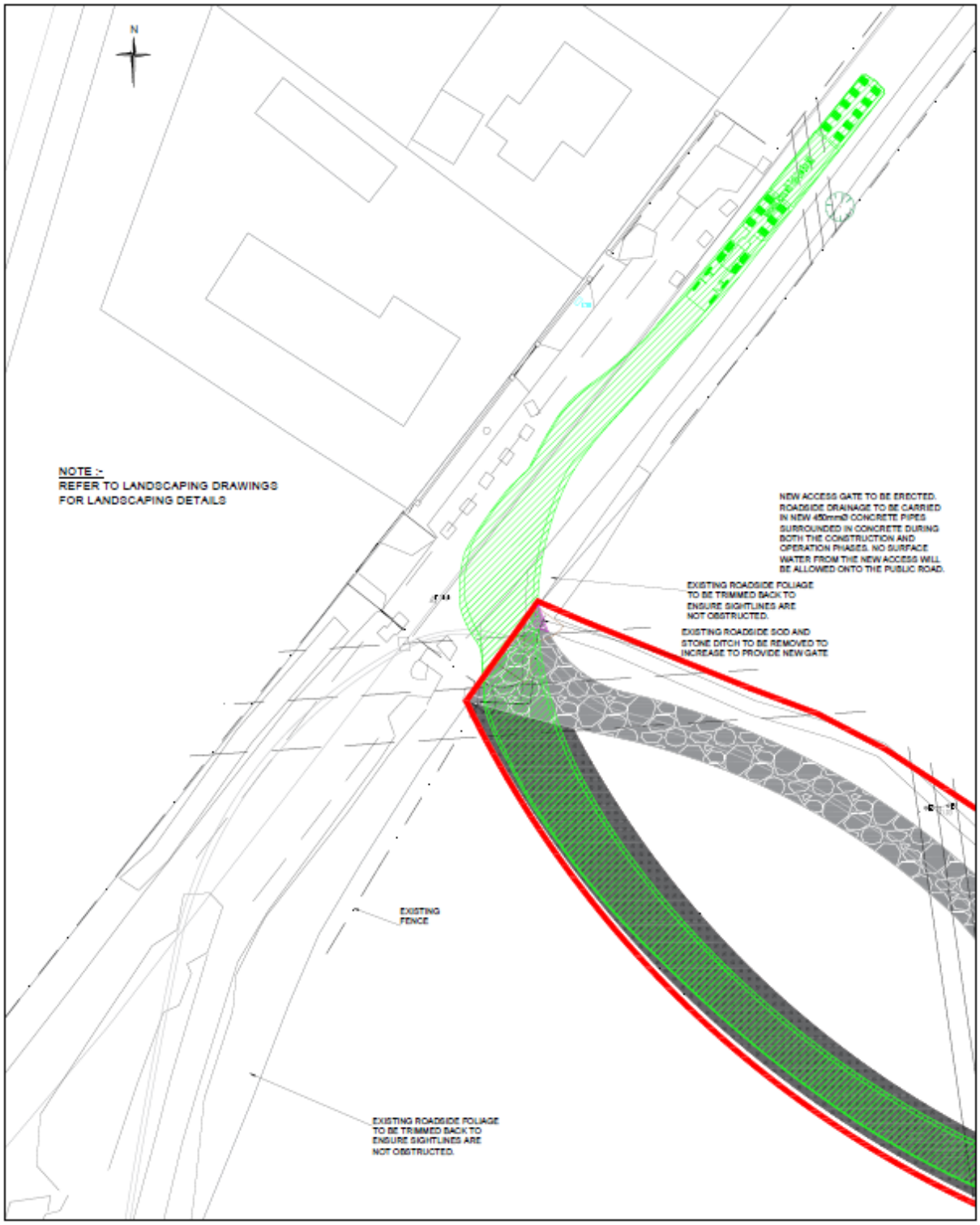


Figure 5-3: Swept Path Analysis of Entrance 1 (Larger scale version of the drawing is in the Appendix)

5.4 COMPLIANCE WITH TII REQUIREMENTS

As outlined in Section 5.1, the delivery route for the proposed development will be via the N29 from Belview Port. It is intended to import substation components, including the transformer via Port of Waterford as a targeted measure to ensure any disruption on the national road network is minimised. The site is c. 3.8km from the Port, a short travel distance on the N29 route which is designed to cater for large road-based freight vehicles. The route has been inspected and been subject to swept path analysis which confirms no difficulties for delivery vehicles proposed for the construction phase.

The Applicant wishes to highlight again that there are no physical or other cabling works proposed within the national road network as part of the proposed SID application. The substation and 'loop-in' grid connection will be constructed entirety on private lands. As such, the potential for impact on the national road network from the proposed development relates to the temporary construction phase only. Given the short travel times to the site from the Port to the subject site, associated traffic will be localised in nature. The submitted construction programme confirms that HGV trips will be highest during the initial enabling works for the substation, but this will equate to a relatively modest average estimate of 11 no. HGVs per day. This figure will drop to an estimated average of 1 HGV per day related to the substation / grid connection works during months 4-12 and fluctuate between an average of 6-7 HGVs per day over the subsequent 4 months. The civil and electrical works on the substation will be completed by the end of month 16.

Based on previous experiences of similar substation / grid connection projects, TII has provided details of construction stage considerations for the implementation of any permission related to the national road network. These relate to the content of a future Construction Traffic Management Plan (CTMP) and will include:

- A requirement to consult with PPP Companies, MMaRC Contractors and road authorities in respect of the construction haul route.
- Any proposed works to the national road network including signage shall comply with TII publications and shall be subject to a road safety audits. All necessary licences or agreements shall be secured from TII, PPP Concession, Motorway Maintenance, MMaRC Companies, local road authorities, as necessary.
- Any proposals or agreements referred to above will be shared with TII;
- Any damage caused to the pavement of the existing national road shall be rectified in accordance with TII Pavement Standards.

The Applicant is happy to confirm that it will reference the above requirements in the final CTMP and will consult with TII, and other parties where necessary, prior to the commencement of development.

Two abnormal load deliveries will be also made to the substation site as part of the construction phase. The Applicant is familiar with the requirements for Exceptional Abnormal Loads (EAL) introduced in 2024, which will be met in full. A prescriptive process exists under the EAL permit granting process which will be navigated with all prescribed agencies / stakeholders to include route definition/agreement, a review of structural requirements, agreed monitoring proposals, and execution. The Applicant notes the detailed requirements for extensive consultation with TII with regard to the use of the N29 for the abnormal load deliveries. The Applicant will comply with TII's requirement that any damage caused to the pavement of the existing national road due to the turning movement of abnormal 'length' loads (e.g. tearing of the surface course) shall be rectified in accordance with TII Pavement Standards and details in this regard shall be agreed with the Road Authority prior to the commencement of any development on site.

We note that under a similar SID application[2] for delivery of electrical infrastructure by means of EAL from Belview Port, TII stipulated that the following condition be attached:

> *Full details of the transportation of all Abnormal Loads and all 'Exceptional Abnormal Loads' associated with the subject development shall be agreed with all planning and road authorities along all proposed haul routes prior to the commencement of any development. In particular, such agreement shall include and address the following requirements;*
>
> *a) The Exceptional Abnormal Load Vehicle diagram shall be provided to include Gross Vehicle Weight; Individual Axle Weights; Axle Spacing; and total vehicle length, width and height. Exceptional Abnormal Load Vehicles shall comply with the standard configuration of a trailer with two bogies and two tractors; one pulling and one pushing as detailed within TII Publications AM-STR-06048.*
> *b) All bridges to be crossed will need a full structural assessment by the developer in accordance with TII Publications AM-STR-06048 to verify that they can sustain the load safely and without any damage.*
> *c) A Chartered Engineer with appropriate experience of assessing bridges for such Exceptional Abnormal Loads shall be required to certify that each structure to be crossed can sustain the loading regime safely and without damage. Appropriate Professional Indemnity Insurance shall also be in place.*
> *d) Each local authority (who own the bridge assets and issue the load permits) shall be provided with an appropriate level of indemnity proportionate to the risk and the value of the bridge structures to be crossed.*
> *e) Each local authority (who own the bridge assets and issue the load permits) shall be provided with insurance cover appropriate to the Risk and the value of the bridge structures to be crossed.*
> *f) Each PPP Company will also need to be consulted as they will have their own Risk / Indemnity requirements, e.g. EuroLink (M3) PPP Concession, M50 PPP Concession.*
> *g) Pre-structural surveys and post-structural surveys will be required.*
>
> **Reason;** *In the interests of safeguarding levels of safety and the strategic function of the national road network in accordance with National Strategic Outcome Number 2 of the National Planning Framework.*

The Applicant is happy for an equivalent condition to be applied in the case of the subject proposed development. The application of this condition will safeguard the carrying capacity, operational efficiency and safety of the national road network in tandem with the delivery of the proposed development at a time when European and national policy is asking us to prioritise the upscaling of renewable energy developments and to fast-track their delivery under, inter alia, REPowerEU and Renewable Energy Directive (RED) III. It is well documented since the summer that REDIII is emergency regulation, with the planning, construction and operation of REDIII projects for the production of renewable energy now presumed to be in the 'overriding public interest'. Section 15 of the Climate Action and Low Carbon Development Act obligations on competent authorities to ensure compliance with binding EU and national commitments in relation to renewable energy development. This extends to a clear presumption in favour of considering and permitting such projects in a timely manner unless there is an explicit reason they cannot. In the case of the proposed development, the Applicant is confident that all of the requirements of TII can be addressed in full prior to commencement of development, consistent with precedent on other permitted projects, and the project will not result in any adverse construction or operational stage impacts on the national road network. The nature of renewable energy projects is such that some interactions with the national road network are generally unavoidable. Notwithstanding this, appropriate and positive planning for the temporary construction phase means that any potential for negative impacts is fully preventable. The Applicant is fully committed to ensuring this is the case through strong partnership working with TII and its partners.

[2] ABP - 319422

6 VERTICAL AND HORIZONTAL ROAD GEOMETRY

6.1 VERTICAL GEOMETRY

It is proposed that guidance documents from the wind farm industry and the forestry industry provide a basis for the vertical geometry review for access specifically for construction vehicles to the proposed solar farm development. These guidance documents are:

- Vestas Transportation Guidelines V52.
- COFORD Forest Road Manual – Guidance for the Design, Construction and Maintenance of Forest Roads.

These documents allow access routes to be appraised in terms of the ability of delivery vehicles to access and egress construction sites for energy projects with regard to vertical geometry. The maximum gradients permitted in these guidance documents are:

- Vestas Transportation Guidelines V52 – 14%.
- Forest Roads Manual – Maximum Engineered Track Gradient – 16.7%.

For precautionary purposes, the lower figure of 14% will be used to assess the vertical geometry in relation to the proposed development.

There are no locations on the proposed delivery routes where the gradient exceeds 14%. The road gradients on the proposed route are shallow. A review of the vertical geometry for crests and dips that could cause difficulties for long wheelbase delivery vehicles was and no significant crests nor dips in the existing alignment were found.

6.2 HORIZONTAL GEOMETRY

For the horizontal geometry review, the same guidance documents as those listed in Section 6.1 form the basis of the review and they are supplemented by the Swept Path Analysis described in Section 5 of this report.

The horizontal geometry design parameters from the guidance documents are:

- Vestas Transportation Guidelines V52: Minimum Inner Bend Radius: 3m, Minimum Outer Bend Radius 27.5m.
- Forest Roads Manual: Desirable Minimum Radius for Curves: 20m; Absolute Minimum Bend Radius at Hairpins: 12m.

The existing horizontal geometry of the proposed route was found to be adequate in accordance with these parameters. The Swept Path Analysis of the proposed delivery route showed that no works are required to the local road network to facilitate the passage of a 40ft articulated lorry to and from the site (see Section 5).

6.3 PAVEMENT WIDTH

Pavement widths measured on site on all roads proposed as access routes to Entrances 1 were in the range 5m to 7.5m. The maximum width of mechanically propelled vehicle permitted on the public road network is 2.7m. The maximum width of a vehicle together with its load is 2.9m (Figure 6.1). Further information with regard to road widths and provision of passing bays can be found in Section 9.

MAXIMUM WIDTH

THESE DIMENSIONS DO NOT APPLY TO A LAND IMPLEMENT OR VEHICLE FOR GRASS CUTTING, HEDGE-TRIMMING OR FORESTRY OPERATIONS WHILE USED IN THE DAY TIME, OR A LAND IMPLEMENT USED DURING LIGHTING UP HOURS FROM JULY TO AUGUST INCLUSIVE, PROVIDED THAT THE VEHICLE COMPLIES WITH THE ROAD TRAFFIC (LIGHTING OF VEHICLES) REGULATIONS 1963 (S.I. NO. 189 OF 1963).

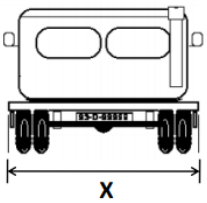
DESCRIPTION	WIDTH (X)	IMAGE
AGRICULTURAL TRAILER / PIECE OF INTERCHANGEABLE TOWED EQUIPMENT	2.55m[8]	
CONDITIONED VEHICLE	2.6m	
LARGE TRACTOR	2.75m	
PASSENGER VEHICLE WITH SEATING CAPACITY FOR MORE THAN EIGHT PASSENGERS	2.55m	
REFRIDGERATED VEHICLE, TRAILER OR SEMI-TRAILER	2.55m (For vehicles first registered or trailers first licensed on or before 31st Dec 1997 the limit was 2.6m but this expired on 31st Dec 2006)	
RIGID TRUCK, TRACTOR UNIT OF AN ARTICULATED VEHICLE, TRAILER OR A SEMI-TRAILER	2.55m (Provided that the vehicle's DGVW exceeds 3.5 tonnes)	
VEHICLE OR TRAILER	2.5m	
VEHICLE TOGETHER WITH ITS LOAD (Apart from loose agricultural produce which is not in bales or crates)	2.9m	

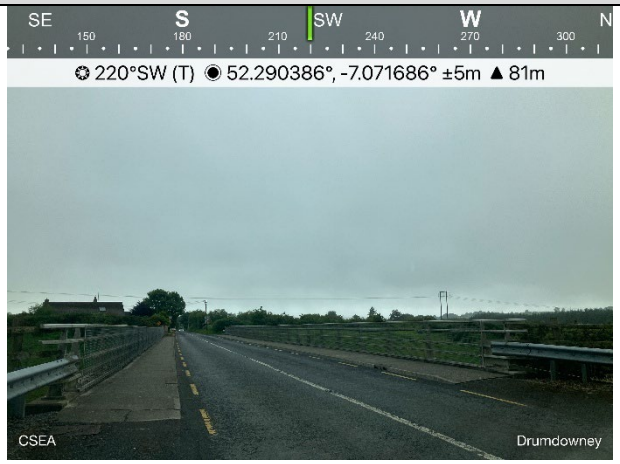
Figure 6-1: Excerpt from Road Safety Authority's publication "Guidelines on Maximum Weights and Dimensions of Mechanically Propelled Vehicles and Trailers including Manoeuvrability" (current version dated March 2020)

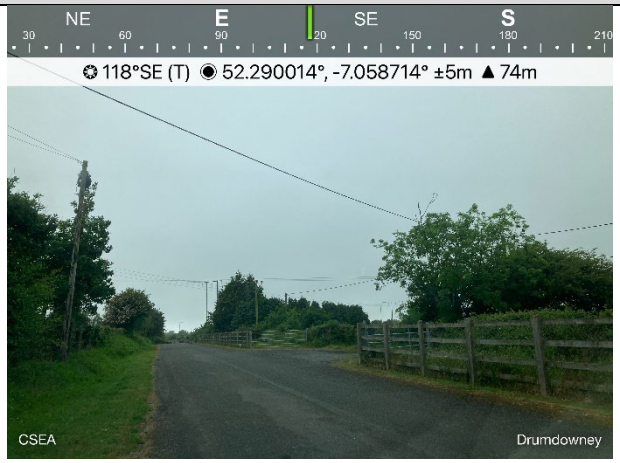
7 PAVEMENT AND ROADSIDE DRAINAGE

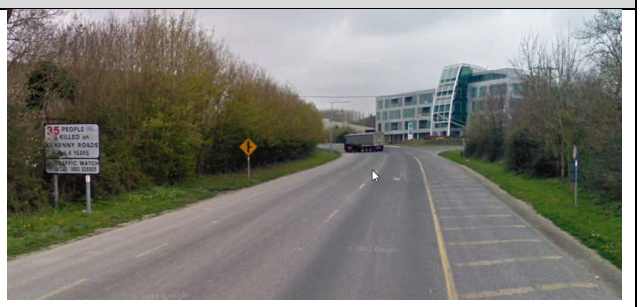
7.1 DELIVERY ROUTE INSPECTION

The delivery route from the Belview Port to the site entrance was inspected in May 2025. The majority of the journey is on the N29 national road, a high-quality road, with the final 300m on the L34141 local road. Pavement conditions and widths were noted as well as roadside drainage and utility plant. Images of the proposed delivery route to the site are provided in Table 7.1. The locations of the images are provided in Figure 7.2. The location co-ordinates of each image are also given on the image in the table below.

Table 7-1: Delivery Route Inspection

No	Description	Image
37	L7469 Wide pavement in good condition.	
38	L4307 Wide pavement in good condition.	

No	Description	Image
39	L34142 Pavement >6m in good condition.	
40	L34142 Entrance 5	
41	L34142 Entrance 5 Pavement >6m in good condition.	

No	Description	Image
101	N29 Pavement in good condition.	
102	N29 Pavement in good condition.	
103	N29 Pavement in good condition.	
104	N29 Pavement in good condition.	
105	N29 Pavement in good condition.	

No	Description	Image
106	N29 Pavement in good condition.	
107	N29 Pavement in good condition.	

Figure 7-1: Delivery Route Image Locations

7.2 PAVEMENT CONDITION AND ROADSIDE DRAINAGE

Pavement condition was found to be good throughout the inspection. Patch repairs are occasionally present. Drainage was typically *over-the-edge* with no particular evidence of ponding areas. Overhead cables are present on part of the delivery route. Pavement width is adequate throughout and all routes are currently used by agricultural vehicles, port vehicles and large commercial vehicles without constraints.

8 SIGHT LINE APPRAISAL AT SITE ENTRANCES

8.1 VISIBILITY STANDARDS

Transport Infrastructure Ireland's document DN-GEO-03060 Geometric Design of Junctions (Priority Junctions, Direct Accesses, Roundabouts, Grade Separated and Compact Grade Separated Junctions) provides the visibility standards required for junctions and accesses. The basic design parameters are shown in Figure 8.1 and include the 'X Distance' which is the distance back along the minor road / direct access from which the full visibility is measured, the 'Y Distance' which is the distance that the driver on the minor road / access road must be able to see clearly to the left and to the right on the nearer edge of the major road carriageway and the 'Z Distance' which is the unobstructed visibility distance that drivers approaching the junction from the minor road / direct access must have to allow him/her to slow down safely and stop.

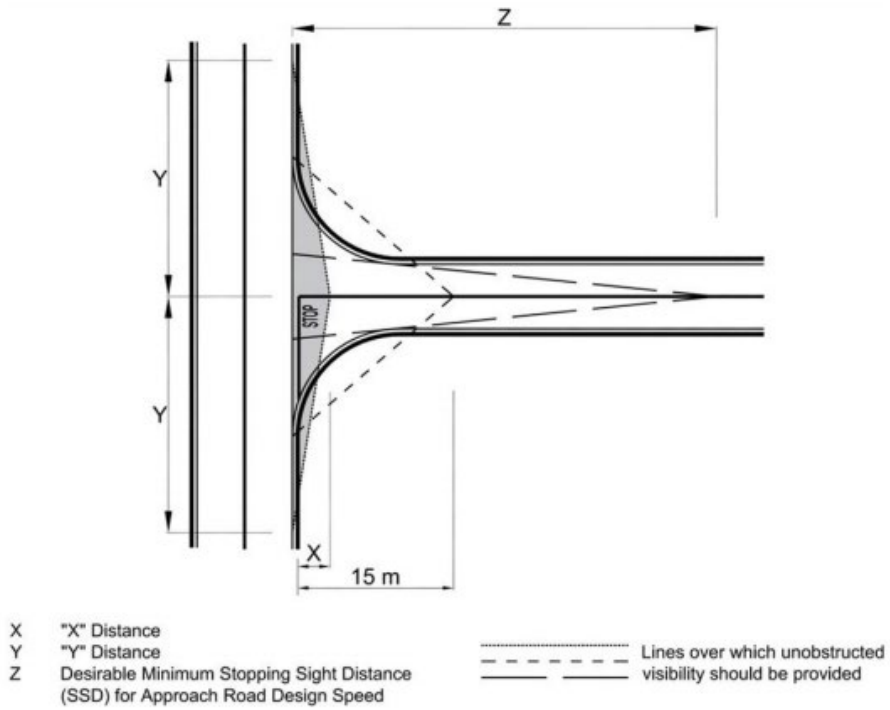


Figure 8-1: Visibility Standards (TII Document DN-GEO-03060)

An 'X Distance' of 2m and a 'Y-Distance' of 90m have been adopted as the minimum visibility standard for the proposed site entrances. The 'Z Distance' is the Stopping Sight Distance and relates to the design speed of the minor road. In the case of direct accesses a 'Z-Distance' of 35m is proposed and this is based on a conservative design speed within the site of 30km/h (Table 5.7 of DN-GEO-03060 refers).

The visibility requirement for drivers emerging from a minor road or direct access is to a high object (1.05m) on the major road. It is best practice (and mandatory for National Roads) that the full 'Y Distance' be achieved to this 1.05 metre height. The purpose of having a high object in the visibility standards is to ensure that vertical geometries of the road junctions are considered in the visibility analysis. An appraisal of the sight lines at the proposed site entrances has been undertaken. Detailed drawings are provided in Appendix A and the analysis results are presented below.

8.2 SITE ENTRANCE 1 (L34142)

The Sight Line Analysis of Site Entrance 1 to the proposed substation is provided in Figure 8.2. It is an existing entrance. The 90m sightlines are available at the proposed location to the north. A sightline of 74m to the end of the cul-de-sac is available on the south side. Detailed drawings are provided in the Appendix to this report. The vertical geometry of the public road is essentially flat at the entrance location and the visibility to the 1.05m high object is achieved over the full 'Y-Distance'. The 'Z-Distance' of 35m is also achieved within the site boundary.

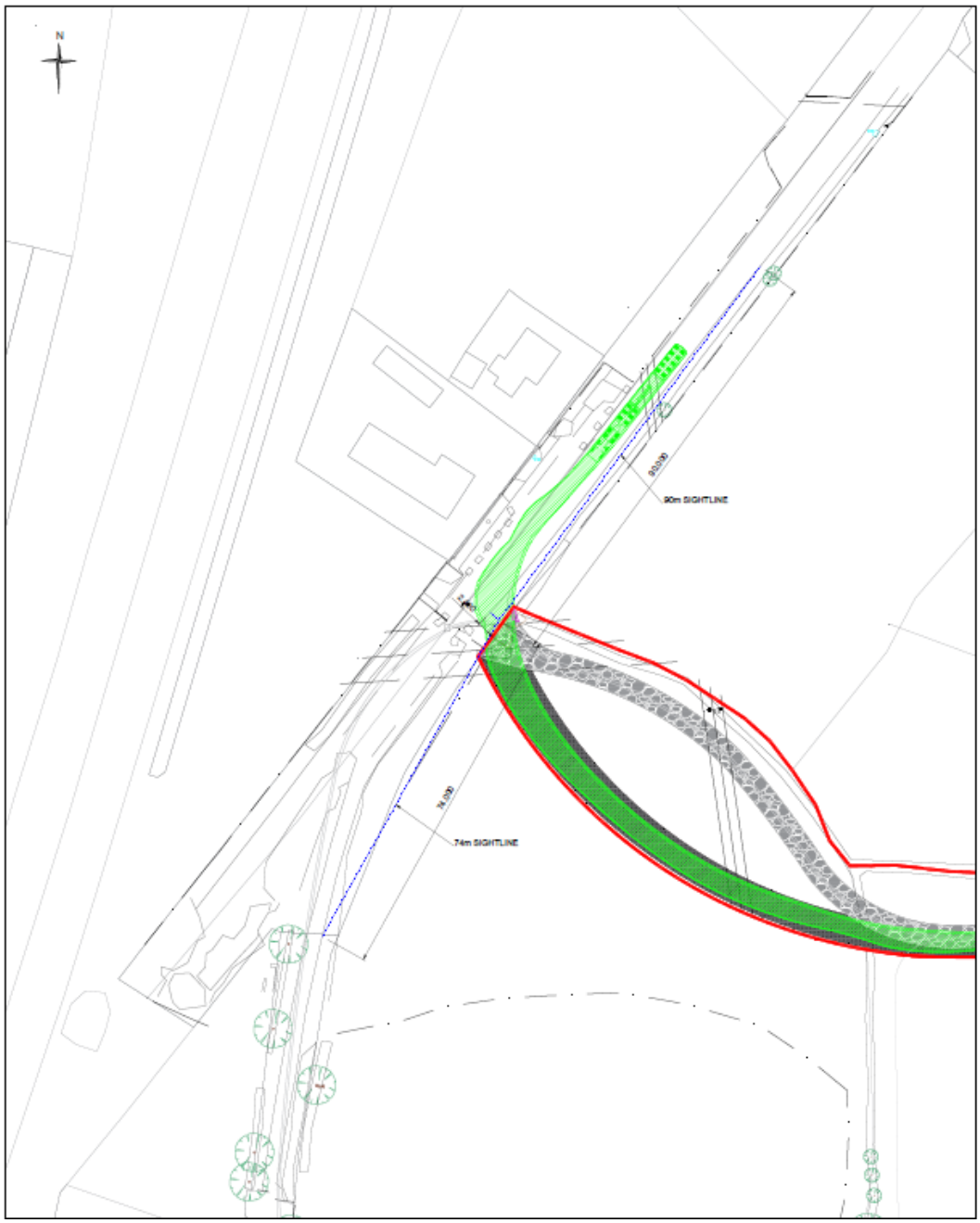


Figure 8-2: Sight Line Analysis Entrance 1 (Larger version drawing in the Appendix)

8.3 DRAINAGE AT SITE ENTRANCES

No surface water from the proposed site entrance will be allowed to drain onto the local road. This will be achieved by the provision of a linear drainage system, within the site lands, which will run parallel to the public road at the site entrance. This drainage system will be designed to intercept any surface water at site entrances and direct such surface water to soakaways located within the site lands. The linear drainage system will be a heavy-duty system with D400 rating to EN 1433 complete with 450 diameter precast concrete drainage pipes in surround concrete to ensure it is of sufficient robustness for site traffic.

9 MITIGATION

As described in Section 4 of this document, the temporary construction phase will see the highest traffic volumes associated with the proposed development. In order to minimise the impact of this temporary period on existing road users and to secure against any impacts on the surface condition of the roads, the following mitigation is proposed during the temporary construction phase. These mitigation measures should be read in conjunction with the Construction Management Plan (*Drumdowney Substation and Grid Connection - Construction Methodology*) submitted with this planning application.

9.1 STOP / GO SYSTEM

It is proposed to provide a temporary manual controlled STOP/GO system, which will briefly stop through traffic flow on local roads, while construction vehicles are accessing and egressing the proposed site entrance. The final layout and sequencing arrangements of the Stop/Go system will be agreed with Kilkenny County Council Area Engineers' Office in advance of commencing construction. Having regard to the low background local traffic observed during this assessment, the modest volumes of construction vehicles set out in Section 4 and the use of the manual controlled STOP/GO system during access /egress of construction traffic only; delays to vehicles waiting at the STOP/GO discs will be of minimal duration.

9.2 ROAD SIGNAGE

It is proposed to provide advance warning signage of the construction site access along the approach roads to the entrance at 50m, 100m and 150m distances in both directions. In addition, there will be advance warning signage to alert road users of the temporary Stop/Go system. All warning signage will be in accordance with Chapter 8 "Temporary Traffic Measures and Signs for Roadworks" from the Department of Transport, Tourism and Sports Traffic Signs Manual.

9.3 BOOKING SYSTEM

To streamline and manage the arrival/departure of construction vehicles over a working day, a delivery booking and scheduling system will be implemented. On a weekly basis the site manager will evaluate the daily profile of truck movements proposed for the upcoming week and schedule them to spread out over the day to prevent any potential overlap. Sufficient time will be given between truck movements to allow for any delays in arrival times or when loading/unloading takes longer than expected. Prior to departure of a delivery truck from the site, the site manager will review the delivery schedule for that day, and if there is any risk of conflict with another scheduled delivery arrival, the departing vehicle will be held on site until that vehicle arrives.

9.4 PAVEMENT CONDITION INDEX SURVEY

Prior to the commencement of works, a detailed Pavement Condition Index Survey will be carried out in accordance with ASTM Standard D8433[3] (or alternative standard to be agreed in advance with Kilkenny County Council). This Pavement Condition Index Survey will be repeated on completion of the works to ascertain if there has been deterioration (beyond normal wear and tear) of the pavement in the works period. Any deterioration which has occurred as a result of works traffic will be addressed by the developer through a programme of remedial works. These remedial measures are subject to Kilkenny County Council's approval and will be agreed with the Council in advance of construction.

9.5 DRAINAGE AT PROPOSED SITE ENTRANCES

No surface water from the proposed site entrance will be allowed to drain onto the local road. This will be achieved by the provision of a linear drainage system, within the site lands, which will run parallel to the public road at the site entrance. This drainage system will be designed to intercept any site surface water at site entrance and direct such surface water to soakaways located within the site lands. The linear drainage system will be a heavy duty system with D400 rating to EN 1433 complete with 450 diameter precast concrete drainage pipes in surround concrete to ensure it is of sufficient robustness for site traffic.

9.6 PROVISION FOR HGV'S ARRIVING AT CLOSED SITE GATES

Site gates shall be set back a sufficient distance to allow HGV's leave the public road and wait for site gates to be opened. This measure is proposed to preclude local delays to traffic which may otherwise occur if a HGV is waiting for gates to be opened.

9.7 EDGE STRENGTHENING WORKS AT SITE ENTRANCES

Edge strengthening works to pavement at site entrances shall be undertaken for a distance of 15m each side of site gates on the public roads to prevent premature edge failure of pavement edges at site entrances.

9.8 REVIEW OF PRECEDENT

The preparation of this report has considered established precedent for solar farm developments in the neighbouring counties, which includes permitted Carlow County Council References 20/143 and 22/163. Under the latter in particular, the following key points were raised at Request for Further Information stage. The response to these items in the context of the proposed development is set out in the right hand column below.

Item Raised	Project Response
Identification of routes for underground ducts / cabling in public roads.	The proposed cable routes are identified in the submitted site layout plans, presented at a scale of 1:500. The application includes a construction methodology by Drumdowney Solar Farm Limited which outlines and explains the construction techniques and methodologies for the electricity cable connections of the

[3] ASTM D8433 Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys

Item Raised	Project Response
	proposed Drumdowney Solar Farm and Substation. This is supplemented by detailed cross-sections on the installations in public roads, including build-up and reinstatement treatments. The works will be completed to best practice standards, with road surfaces reinstated to existing or better condition. The submitted plans confirm that all works related to opening, backfilling and reinstatement of trenches will be as per the Department of Transport Guidelines for Managing Openings in Public Roads. The Applicant shall comply with '*Electrical Transmission Infrastructure Development – Roads Sector Engagement Framework*' circulated by the Department of Transport in March 2025.
Demonstrate that HGVs will not park on the public road in the event of site gates not been open.	Site gates shall be set back a sufficient distance to allow HGV's leave the public road and wait for site gates to be opened. In practice, parking on the road will not occur, as deliveries will be sequenced to arrive when the site is open only and personnel are on hand to receive same. As outlined in the submitted Construction Management Plan, all HGV deliveries will be proactively managed on site to ensure there are no localised road impacts. All associated procedures will be agreed as part of the final CMP.
Prevent 'edge break' on the public roads at access points.	As confirmed in Section 10.7 above, edge strengthening works to pavement at site entrances shall be undertaken for a distance of 15m each side of site gates on the public roads to prevent premature edge failure of pavement edges at site entrances. All specifications will be agreed with Kilkenny County Council.
Demonstrate that sight lines are achieved at all entrances	The application includes sightline drawings confirm achievable sightlines, which will not be inhibited by obstacles in the sightline triangle. Operational sightlines will be maintained by means of trimming back hedgerows.
Confirm drainage arrangements at entrances to ensure there is no surface runoff to public roads.	As confirmed in Section 9.3 above, no surface water from the proposed site entrances will be allowed to drain onto the local roads. This will be achieved by the provision of a linear drainage system, within the site lands, which will run parallel to the public road at the site entrances.
Requirement for Traffic Management Plan, including access / egress plan for construction works to ensure all workers are not leaving the site at the same time.	A Preliminary Traffic Management Plan will be developed and audited at pre-construction stage and be submitted to Kilkenny County Council for agreement/signoff.
Backfilling of pits in public road areas and confirmation of approach to management of excavated material in the public road.	All works related to opening, backfilling and reinstatement of trenches will be as per the Department of Transport Guidelines for Managing Openings in Public Roads. The submitted Construction Methodology for the Drumdowney Solar Farm confirms that excavated material will be incorporated as backfill

Item Raised	Project Response
	and that existing road build-ups will be confirmed with Kilkenny County Council to ensure reinstatement is agreed. No large areas for stockpiling excavated material will be required. As per commitments in the construction methodology, any surplus material will be transported off site and disposed of at a fully authorised soil recovery site. The volumes will be low and any impact on local traffic will be negligible.
Confirm requirements for road closures, including any detour plans.	There are no intentions or requirements to close any roads as part of the temporary construction phase. All localised traffic management measures will be discussed and agreed with Kilkenny County Council as part of the final CEMP

10 SUMMARY AND CONCLUSION

An engineering appraisal of the local road network for the proposed substation at Drumdowney in County Kilkenny has been undertaken. The site is well served by the local and national road network. The local topography comprises gentle gradients and there are no severe inclines present that adversely affect road geometry. Continuing liaison with Kilkenny County Council Area Engineers will be required at all stages of the project to ensure local issues are considered as the project plans develop.

A detailed breakdown of the vehicle numbers associated with the temporary 24-month construction phase of the development has been provided. For the purposes of worst case and cumulative traffic impact assessment, both the solar farm and the substation and grid connection development are considered in this report. Over the 24-month period, the average number of HGV vehicles is 10 per day. A 5.5 day week is assumed as per normal construction projects. The peak number of HGV trips is 21 per day with a hourly average of 2.6. This peak activity is associated with civil works and solar farm set up. Vehicle trips reduce substantially in the final months of the programme. This traffic will cease when the construction of the solar farm commences and remain absent from the local road network thereafter. Given that traffic numbers for the solar farms operational phase are an average of 2 – 4 vehicles per month, it is proposed that over the lifetime of the project there will be a net reduction of traffic related to the subject site on the local road network.

A Swept Path Analyses of the delivery route proposed to the site entrance shows that no works are required to the local road network to facilitate the passage of a 40ft articulated vehicle or a special abnormal load delivery vehicles to the site entrance. Sightlines have been appraised for the proposed entrance. The proposed entrances are existing and operational field entrances. The 90m sightline is available at the proposed location to the north. A sightline of 74m to the end of the cul-de-sac is available on the south side.

The average gradients on the local road delivery routes are shallow and will not be problematic for delivery vehicles. A review of the horizontal alignment of the delivery routes coupled with the Swept Path Analyses described above shows that there are no issues of concern for the passage of delivery vehicles around horizontal road bends. The pavement width on the delivery route is typically between 5m and 7.5m and can accommodate the largest construction vehicle which will access the substation during the temporary construction period.

A suite of mitigation measures is proposed for the construction phase of the development as part of this site access appraisal. These include separate access routes for northern and southern entrances, a temporary Stop/Go system, temporary road signage, a booking system for construction deliveries and a pavement condition survey. At the proposed site entrances, new drainage works will mitigate the potential for surface water flowing onto the adjacent public roads.

When the existing conditions are taken into account with construction phase mitigation and a net reduction in traffic volumes over the project lifetime, it is proposed that the substation at Drumdowney in County Kilkenny does not pose any significant residual risks and on this basis, should be granted planning permission.

APPENDIX A

DRAWINGS

PROPOSED SITE PLAN
(Scale 1 to 15,000)

Client

Drumdowney Solar Farm Ltd.

General Notes

No.	Date	Dsn. / Chk.	Amendment / Issue	App
D01	Dec.'25	DC / KR	DRAFT ISSUE FOR DISCUSSION	KR

CIVIL AND STRUCTURAL
ENGINEERING ADVISORS LTD.

Drawn	DC
Checked	KR
Approved	KR
Date	Dec. 2025
Scale	Half @ A3
Shown	@ A1
Job No.	

Project: **Drumdowney Substation**

Title: Proposed Site Plan
(Sheet 1 of 1)

File Ref.	Drg. No.	Rev.
2025-03-10.dwg	01	D01

PROPOSED DELIVERY ROUTE

(Scale 1 to 15,000)

Client

Drumdowney Solar Farm Ltd.

General Notes

No.	Date	Dsn. / Chk.	Amendment / Issue	App
D01	Dec.'25	DC / KR	DRAFT ISSUE FOR DISCUSSION	KR

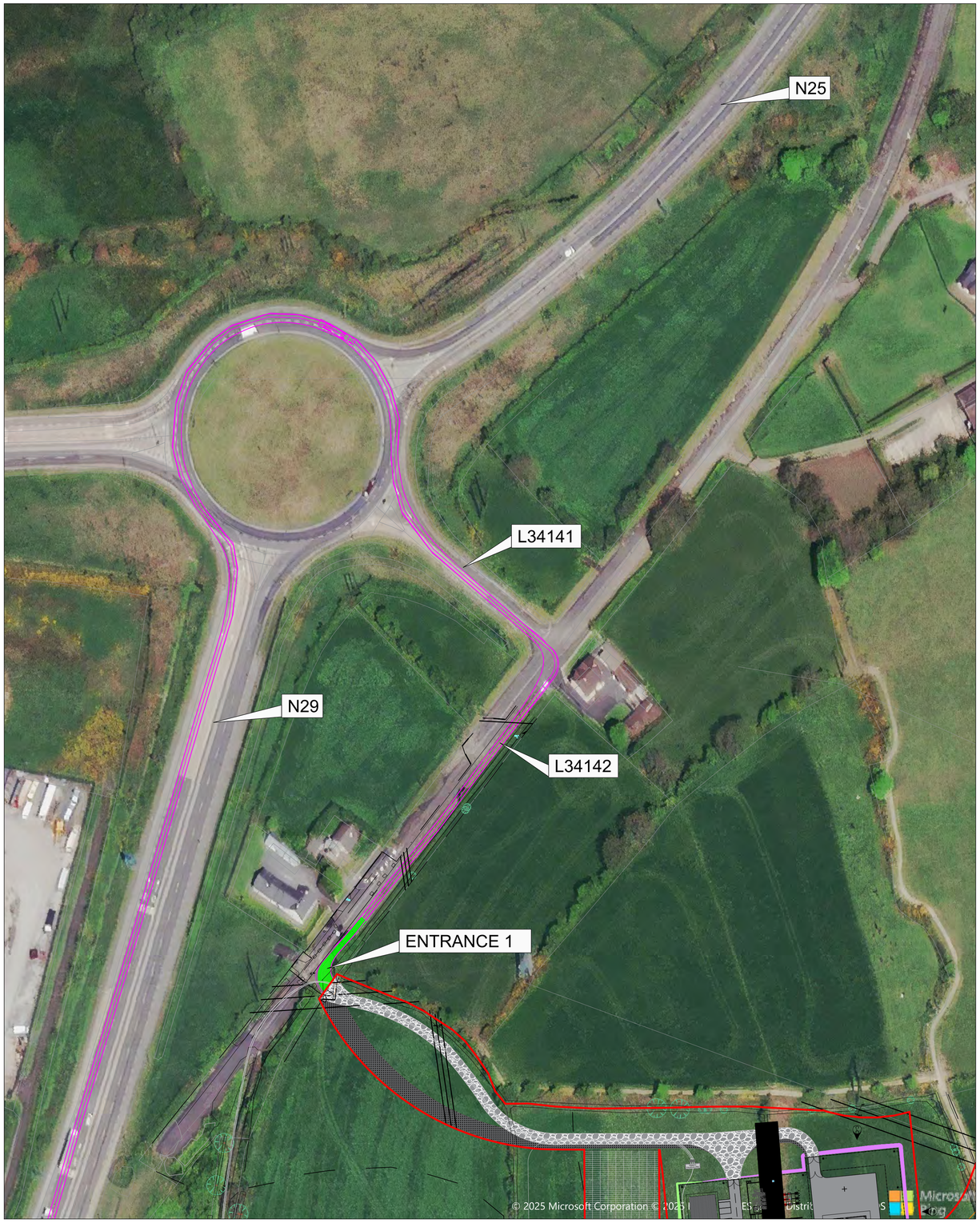
CIVIL AND STRUCTURAL ENGINEERING ADVISORS LTD.

Drawn	DC
Checked	KR
Approved	KR
Date	Dec. 2025
Scale	Half @ A3
Shown	@ A1

Project: **Drumdowney Substation**

Title: Proposed Delivery Route For Solar Farm Construction 1 : 15,000 (Sheet 1 of 1)

Job No.	File Ref.	Drg. No.	Rev.
	2025-03-11.dwg	01	D01



Proposed Delivery Route With Swept Path Analysis Lines Shown On Route
(Scale 1 to 1000)

Client

Drumdowney Solar Farm Ltd.

General Notes

No.	Date	Dsn. / Dwn.	Amendment / Issue	App
D01	Dec.'25	DC / KR	DRAFT ISSUE FOR DISCUSSION	KR

CIVIL AND STRUCTURAL
ENGINEERING ADVISORS LTD.

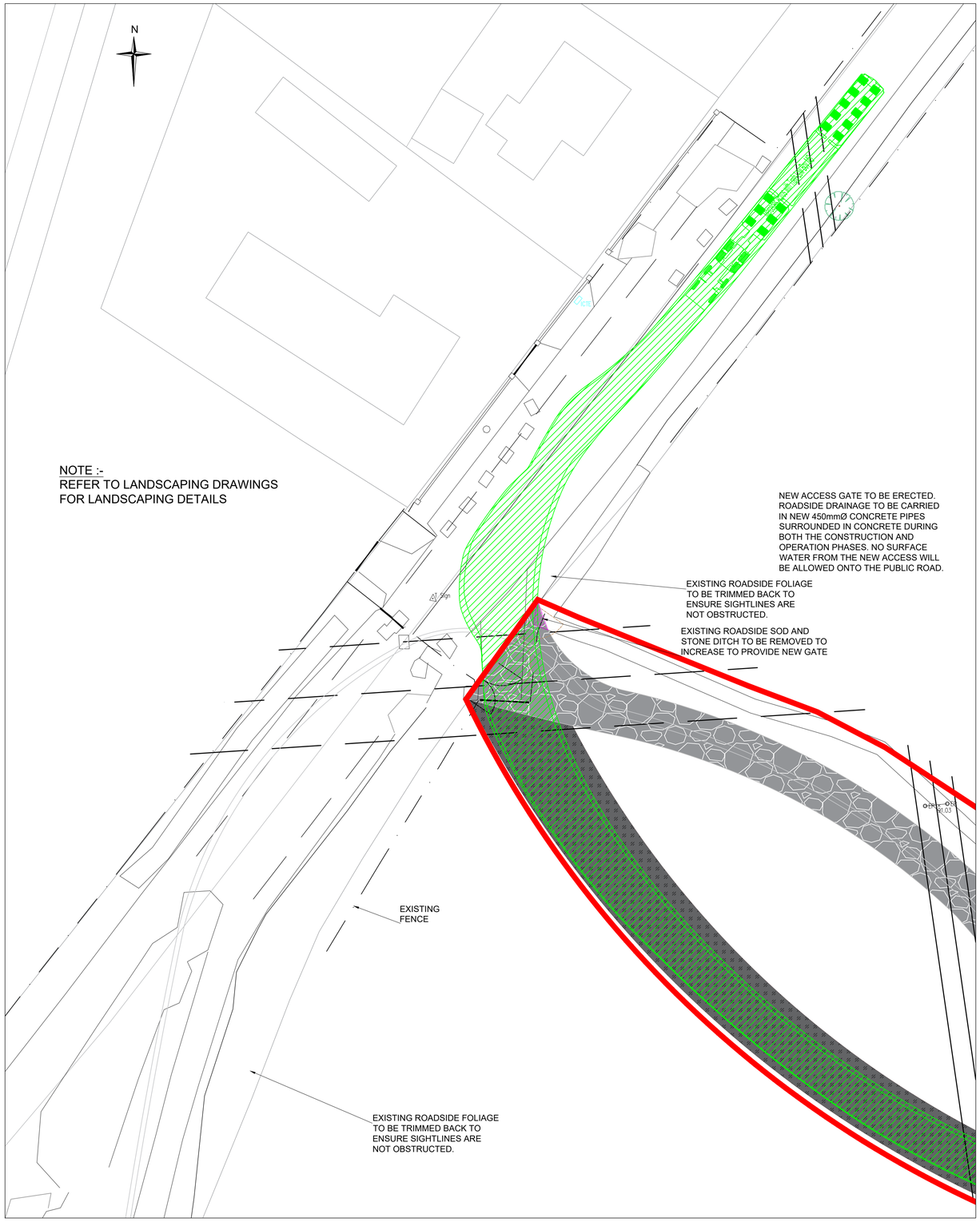
Drawn	DC
Checked	KR
Approved	KR
Date	Dec. 2025
Scale	Half @ A3
Shown	@ A1

Project: **Drumdowney Substation**

Title: Proposed Delivery Route For Solar Farm Construction 1 : 1,000
(Sheet 1 of 1)

Job No.	File Ref.	Drg. No.	Rev.
	2025-03-12.dwg	01	D01

PROPOSED SITE ACCESS 1 - SIGHTLINES
(Scale 1 : 500)



PROPOSED SITE ACCESS 1 - ENTRANCE
(Scale 1 : 250)

Client

Drumdowney Solar Farm Ltd.

General Notes

No.	Date	Dr/Chk	Amendment / Issue	App
D01	Dec.'25	DC/KR	DRAFT ISSUE FOR DISCUSSION	KR

CSEA CIVIL AND STRUCTURAL ENGINEERING ADVISORS LTD.

Drawn	DC
Checked	KR
Approved	KR
Date	Dec. 2025
Scale	Half @ A3
	Shown @ A1

Project: **Drumdowney Substation**

Title: Proposed Site Entrance 1

Job No.	File Ref.	Drg. No.	Rev.
	2025-03-13.dwg	01	D01

APPENDIX B

CUMULATIVE TRAFFIC ASSESSMENT

CIVIL AND STRUCTURAL
ENGINEERING ADVISORS LTD.

1: Assumptions and Basis of Calculations

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Site Components	Site Specific Information	Truck calculations/justifications per item	Notes
Machinery Mobilisation (machine number)	**See Solar Parcel HGV Calcs**	Delivery of fleet of machines which are to be shared and deployed across the site as construction advances in different parcels	Excavators, pile drivers, rollers, forklifts, dumpers, etc
Number of Panels		no. panels / 720	40 ft container (truck), information gathered from Canadian Solar datasheet (each 40ft container can carry 720 panels). Note: The final number of panels may change depending on the final detailed design but that there will be no significant increase in overall traffic volumes as a result
Mounting System (approx site MW)		Approx 2 deliveries per MW	articulated lorry
Inverter/transformers, Spare Part containers, battery containers, RMUs		1 vehicle per Inverter/Transformer and Spare Parts, 1 vehicle per 2 RMUs	
Inverter/transformer Foundations		Vehicles = Number of inverters/spare containers*3	3 Concrete deliveries are needed for each inverter/transformer station
Length of Fencing (m)		length of perimeter fencing (m) / 3000	articulated lorry
Area of access tracks (m^2)		gravel needed = area of track(m^2) * 0.25(m) to get volume of total, divide by 11.9 m^3 truck (the capacity of standard 20ft truck)	Assuming 250 mm depth
Area of construction compound (m^2)		temporary matting (e.g. Dura-Base) used as surface for construction compound, comes in 450 m^2 swatches	Figures accounts for temporary matting to be delivered and removed
Length of AC cable trenches (Varied Width)		no. of deliveries = ((Length of trench) * (backfill height) * (trench width)) - (Duct Volume)/11.9 m^3 truck	See Parcel Breakdowns for details of each circuits
Length of DC cable trenches		no. of deliveries = ((Length of trench) * (100mm backfill) * (trench width)) - (Duct Volume)/11.9 m^3 truck	DC cabling is assumed to be 1.5 the length of AC cabling
AC cabling (cable length)		length of AC cabling / 220 = No. drums, No. drums / 2 = number of truck deliveries	Each circuit has three cables
DC cabling (MW)		0.125 containers / MW	40 ft container truck
Ducting (m)		No. trucks = Length/2880m	
Welfare facilities within compound		Small construction compound (1200m^2) assumed to have 3 containers. Larger construction compound (2610m^2) assumed to have 5 containers. One Vehicle per container	Small Construction Compound
Machinery demobilisation (machine number)		Delivery of fleet of machines which are to be shared and deployed across the site as construction advances in different parcels	Excavators, pile drivers, rollers, forklifts, dumpers etc

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2: Field Parcel Calculations

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Parcel 1 - Entrance From L3429

Site Components	Site Specific Information	Truck calculations/justifications per item	Total Vehicles	Vehicle Type	Notes
Machinery Mobilisation (machine number)	**40**	range 10-15 machinery deliveries for medium sized site (10-20 MW) - 40MW site = 20-40 deliveries	**40**	HGV	Excavators, pile drivers, rollers, forklifts, dumpers, etc
Number of Panels	**52090**	no. panels / 720	**73**	HGV	40 ft container (truck), information gathered from Canadian Solar datasheet (each 40ft container can carry 720 panles)
Mounting System (site MW)	**34.9**	2 deliveries per MW	**70**	HGV	articulated lorry
Inverter/transformers, Spare Part containers, battery containers, RMUs	**6**	1 vehicle per Inverter/Transformer and Spare Parts, 1 vehicle per 2 RMUs	**6**	HGV	5 Inverters, 1 Spare Part Container
Inverter/transformer Foundations	**5**	Vehicles = Number of inverters*3	**15**	HGV	3 Concrete deliveries are needed for each inverter/transformer station
Length of Fencing (m)	**2977**	length of perimeter fencing (m) / 3000	**1**	HGV	articulated lorry
Area of access tracks (m^2)	**3042**	gravel needed = area of track(m^2) * 0.25(m) to get volume of total, divide by 11.9	**64**	Rigid Dumper Truck	Assuming 250 mm depth. 4960m^3 of this access track is upgrading of an existing track, therefore 50% of materials assumed.
Area of construction compound (m^2)	**2610**	temporary matting (e.g. Dura-Base) used as surface for construction compound, comes in 450 m^2 swatches	**12**	HGV	Figures accounts for temporary matting to be delivered and removed
Length of AC cable trenches (0.42m wide) - Track	**653**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**19**	Rigid Dumper Truck	Based on 33kV trench detail for Single Circuit. 110mm Ducts x 4 in access track
Length of AC cable trenches (0.42 wide) -Grassland	**889**	no. of deliveries = ((Length of trench) * (545mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**15**	Rigid Dumper Truck	Based on 33kV trench detail for Single Circuits. 110mm Ducts x 4 in grassland track or road
Length of AC cable trenches (0.45 m wide) - Public Road	**3649**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**113**	Rigid Dumper Truck	Based on 33kV trench detail for Single Circuit. 110mm Ducts x 4 in Public Road
Length of DC cable trenches	**7787**	no. of deliveries = ((Length of trench) * (100mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**92**	Rigid Dumper Truck	DC cabling is assumed to be 1.5 the length of AC cabling
AC cabling (cable length)	**15573**	length of AC cabling / 220 = No. drums, No. drums / 2 = number of truck deliveries	**36**	HGV	Each circuit has three cables
DC cabling (MW)	**34.9**	0.125 containers / MW	**5**	HGV	40 ft container truck
Ducting (m)	**20764**	No. trucks = Length/2880m	**8**	HGV	
Welfare facilities within compound	**5**	Small construction compound (1200m^2) assumed to have 3 containers. Larger construction compound (2610m^2) assumed to have 5 containers. One Vehicle per container	**10**	HGV	Small Construction Compound
Machinery demobilisation (machine number)	**40**	range 10-15 machinery deliveries for medium sized site (10-20 MW) - 40MW site = 20-40 deliveries	**40**	HGV	Excavators, pile drivers, rollers, forklifts, dumpers etc
Total HGVs	**316**				
Total Rigid Dumper Trucks	**303**				
Subtotal	**619**				
Contingency (5%)	**31**				
Total	**650**				

Parcel 2 - Entrance from the L7469

Site Components	Site Specific Information	Truck calculations/justifications per item	Total Vehicles	Vehicle Type	Notes
Machinery Mobilisation (machine number)	**15**	range 10-15 machinery deliveries for medium sized site (10-20 MW) - 40MW site = 20-40 deliveries	**15**	HGV	Excavators, pile drivers, rollers, forklifts, dumpers, etc
Number of Panels	**12478**	no. panels / 720	**18**	HGV	40 ft container (truck), information gathered from Canadian Solar datasheet (each 40ft container can carry 720 panles)
Mounting System (site MW)	**8.36**	2 deliveries per MW	**17**	HGV	articulated lorry
Inverter/transformers, Spare Part containers, battery containers, RMUs	**4**	1 vehicle per Inverter/Transformer and Spare Parts, 1 vehicle per 2 RMUs	**4**	HGV	2 Inverters, 1 Spare Part Container, 1 RMUs
Inverter/transformer Foundations	**2**	Vehicles = Number of inverters*3	**6**	HGV	3 Concrete deliveries are needed for each inverter/transformer station
Length of Fencing (m)	**1700**	length of perimeter fencing (m) / 3000	**1**	HGV	articulated lorry
Area of access tracks (m^2)	**3372**	gravel needed = area of track(m^2) * 0.25(m) to get volume of total, divide by 10	**71**	Rigid Dumper Truck	Assuming 250 mm depth
Area of construction compound (m^2)	**2610**	temporary matting (e.g. Dura-Base) used as surface for construction compound, comes in 450 m^2 swatches	**12**	HGV	Figures accounts for temporary matting to be delivered and removed
Length of AC cable trenches (0.42m wide) - Track	**622**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**18**	Rigid Dumper Truck	Based on 33kV trench detail for Single Circuit. 110mm Ducts x 4 in access track or road
Length of AC cable trenches (0.45m wide) -Public Road	**2414**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**69**	Rigid Dumper Truck	Based on 33kV trench detail for Single Circuit. 110mm Ducts x 4 in grassland
Length of AC cable trenches (0.74m wide) -Public Road	**1467**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**73**	Rigid Dumper Truck	Based on 33kV trench detail for Double Circuit. 110mm Ducts x 8 (When Interconnector 2 is adjacent to Interconnector 4)
Length of DC cable trenches	**6754.5**	no. of deliveries = ((Length of trench) * (100mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**95**	Rigid Dumper Truck	DC cabling is assumed to be 1.5 the length of AC cabling
AC cabling (cable length)	**17910**	length of AC cabling / 220 = No. drums, No. drums / 2 = number of truck deliveries	**41**	HGV	Each circuit has three cables
DC cabling (MW)	**8.36**	0.125 containers / MW	**2**	HGV	40 ft container truck
Ducting (m)	**23880**	No. trucks = Length/2880m	**9**	HGV	
Welfare facilities within compound	**5**	Small construction compound (1200m^2) assumed to have 3 containers. Larger construction compound (2610m^2) assumed to have 5 containers. One Vehicle per container	**10**	HGV	Small Construction Compound
Machinery demobilisation (machine number)	**15**	range 10-15 machinery deliveries for medium sized site (10-20 MW) - 40MW site = 20-40 deliveries	**15**	HGV	Excavators, pile drivers, rollers, forklifts, dumpers etc
Total HGVs	**150**				
Total Rigid Dumper Trucks	**326**				
Subtotal	**476**				
Contingency (5%)	**24**				
Total	**500**				

Parcel 3 - Entrance from the L7466

Site Components	Site Specific Information	Truck calculations/justifications per item	Total Vehicles	Vehicle Type	Notes
Machinery Mobilisation (machine number)	**40**	range 10-15 machinery deliveries for medium sized site (10-20 MW) - 40MW site = 20-40 deliveries	**40**	HGV	Excavators, pile drivers, rollers, forklifts, dumpers, etc
Number of Panels	**41284**	no. panels / 720	**58**	HGV	40 ft container (truck), information gathered from Canadian Solar datasheet (each 40ft container can carry 720 panles)
Mounting System (site MW)	**27.66**	2 deliveries per MW	**56**	HGV	articulated lorry
Inverter/transformers, Spare Part containers, battery containers, RMUs	**6**	1 vehicle per Inverter/Transformer and Spare Parts, 1 vehicle per 2 RMUs	**6**	HGV	4 Inverters, 1 Spare Part Container, 1 RMUs
Inverter/transformer Foundations	**4**	Vehicles = Number of inverters*3	**12**	HGV	3 Concrete deliveries are needed for each inverter/transformer station
Length of Fencing (m)	**6019**	length of perimeter fencing (m) / 3000	**3**	HGV	articulated lorry
Area of access tracks (m^2)	**4766**	gravel needed = area of track(m^2) * 0.25(m) to get volume of total, divide by 10	**101**	Rigid Dumper Truck	Assuming 250 mm depth
Area of construction compound (m^2)	**2610**	temporary matting (e.g. Dura-Base) used as surface for construction compound, comes in 450 m^2 swatches	**12**	HGV	Figures accounts for temporary matting to be delivered and removed
Length of AC cable trenches (0.42m wide) - Track	**981**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**29**	Rigid Dumper Truck	Based on 33kV trench detail for Single Circuit. 110mm Ducts x 4 in public road
Length of AC cable trenches (0.45m wide) -Public Road	**2091**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**65**	Rigid Dumper Truck	Based on 33kV trench detail for Single Circuit. 110mm Ducts x 4 in access track or road (Interconnector 4 alongside Interconnector 2 is accounted for in Parcel 2)
Length of DC cable trenches	**4608**	no. of deliveries = ((Length of trench) * (100mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**65**	Rigid Dumper Truck	DC cabling is assumed to be 1.5 the length of AC cabling
AC cabling (cable length)	**9216**	length of AC cabling / 220 = No. drums, No. drums / 2 = number of truck deliveries	**21**	HGV	Each circuit has three cables
DC cabling (MW)	**27.66**	0.125 containers / MW	**4**	HGV	40 ft container truck
Ducting (m)	**12288**	No. trucks = Length/2880m	**5**	HGV	
Welfare facilities within compound	**5**	Small construction compound (1200m^2) assumed to have 3 containers. Larger construction compound (2610m^2) assumed to have 5 containers. One Vehicle per container	**10**	HGV	Small Construction Compound
Machinery demobilisation (machine number)	**40**	range 10-15 machinery deliveries for medium sized site (10-20 MW) - 40MW site = 20-40 deliveries	**40**	HGV	Excavators, pile drivers, rollers, forklifts, dumpers etc
Total HGVs	**267**				
Total Rigid Dumper Trucks	**260**				
Subtotal	**527**				
Contingency (5%)	**26**				
Total	**554**				

Parcel 4 - Entrance from the L7483 or L7582 and private lands

Site Components	Site Specific Information	Truck calculations/justifications per item	Total Vehicles	Vehicle Type	Notes
Machinery Mobilisation (machine number)	**40**	range 10-15 machinery deliveries for medium sized site (10-20 MW) - 40MW site = 20-40 deliveries	**40**	HGV	Excavators, pile drivers, rollers, forklifts, dumpers, etc
Number of Panels	**175119**	no. panels / 720	**244**	HGV	40 ft container (truck), information gathered from Canadian Solar datasheet (each 40ft container can carry 720 panles)
Mounting System (site MW)	**117.33**	2 deliveries per MW	**235**	HGV	articulated lorry
Inverter/transformers, Spare Part containers, battery containers, RMUs	**17**	1 vehicle per Inverter/Transformer and Spare Parts, 1 vehicle per 2 RMUs	**17**	HGV	16 Inverters, 1 Spare Part Container
Inverter/transformer Foundations	**16**	Vehicles = Number of inverters*3	**48**	HGV	3 Concrete deliveries are needed for each inverter/transformer station
Length of Fencing (m)	**7739**	length of perimeter fencing (m) / 3000	**3**	HGV	articulated lorry
Area of access tracks (m^2)	**7190**	gravel needed = area of track(m^2) * 0.25(m) to get volume of total, divide by 10	**152**	Rigid Dumper Truck	Assuming 250 mm depth
Area of construction compound (m^2)	**2610**	temporary matting (e.g. Dura-Base) used as surface for construction compound, comes in 450 m^2 swatches	**12**	HGV	Figures accounts for temporary matting to be delivered and removed
Length of AC cable trenches (1.06m wide) - Track	**1685**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**119**	Rigid Dumper Truck	Based on 33kV trench detail for Triple Circuit . 110mm Ducts x 12 in access track or road
Length of AC cable trenches (1.06m wide) -Grassland	**234**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**17**	Rigid Dumper Truck	Based on 33kV trench detail for Triple Circuit. 110mm Ducts x 12 in grassland
Length of AC cable trenches (1.06m wide) -Public Road	**2668**	no. of deliveries = ((Length of trench) * (900mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**189**	Rigid Dumper Truck	Based on 33kV trench detail for Triple Circuit. 110mm Ducts x 12 in public road
Length of DC cable trenches	**6880.5**	no. of deliveries = ((Length of trench) * (100mm backfill) * (trench width)) · (Duct Volume)/11.9 m^3 truck	**97**	Rigid Dumper Truck	DC cabling is assumed to be 1.5 the length of AC cabling
AC cabling (cable length)	**41283**	length of AC cabling / 220 = No. drums, No. drums / 2 = number of truck deliveries	**94**	HGV	Each circuit has three cables
DC cabling (MW)	**117.33**	0.125 containers / MW	**15**	HGV	40 ft container truck
Ducting (m)	**55044**	No. trucks = Length/2880m	**20**	HGV	
Welfare facilities within compound	**5**	Small construction compound (1200m^2) assumed to have 3 containers. Larger construction compound (2610m^2) assumed to have 5 containers. One Vehicle per container	**10**	HGV	Small Construction Compound
Machinery demobilisation (machine number)	**40**	range 10-15 machinery deliveries for medium sized site (10-20 MW) - 40MW site = 20-40 deliveries	**40**	HGV	Excavators, pile drivers, rollers, forklifts, dumpers etc
Total HGVs	**778**				
Total Rigid Dumper Trucks	**574**				
Subtotal	**1352**				
Contingency (5%)	**68**				
Total	**1420**				

Total HGVs	**3124**

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3: Substation Calculations

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Drumdowney Solar Farm - Substation HGVs

	Deliveries	
Transformer	***1***	
Substation Import/Export	7868	m3
Delivery per truck	11.9	m3
Total HGV Import/Export	***661.18***	
Concrete	***25***	
Offices	***6***	
Fencing	***4***	
Electrical Equipment	***20***	
Cable Drums	***8***	
Joint bays	***1***	
Building Blocks	***4***	
Roof Joists	***2***	
Miscellaneous Deliveries	***20***	
Sub-Total	**752**	
20% Contingency	**150**	
TOTAL	**903**	

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4: Grid Connection Calculations

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Drumdowney Solar Farm - Grid Connection HGVs

Zone	Circuit	UGC Route Length (m)	Duct Size (mm)	No. ducts in Trench	Lengths Required	Lengths Required (Rounded)
	A	151	160	3	75.5	76
	B	151	125	2	50.33	51
	C	151	63	1	25.17	26

Volume Of Ducts

Duct Diameter	No of Ducts		Ducts Volume (m^3)
160	3	6.07	19
125	2	3.71	8
63	1	0.94	1
		Total m^3	28

Material	Width(mm)	Depth(mm)	m^3	Tonnes
Topsoil	825	675	85	127.5
CBGM Minus Ducts	825	750	94	150.6
		Total	179	268.5

Material	Tonnes	Tonnes per truck	Vehicle Movement (One Way)
Topsoil	128	20	7
Material to be removed fr	151	20	8
CBGM	151	20	8
		Construction Estimate	23
		Deliveries	528
		Total	551

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5: Overall Construction Stage Traffic Assessment and Programme

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Estimated Construction Programme & Vehicle Numbers

	Construction Programme (Months)																							
Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Substation Construction																								
Enabling Works	250	250	250																					
Civil Works				20	20	20	20	20	20	20														
Electrical Works											20	20	15	10	5									
Grid Connection Construction																								
Civil and Electrical Works													137	138	138	138								
Substation Electrical Commissioning																								
Pre-commissioning																								
ESB Commissioning																								
Solar Farm Construction																								
Solar Farm Site Set Up & Installation							323	440	235	287	99	99	99	202	112	112	301	301	298	22	22	4	96	71
Solar Farm Electrical Commissioning																								
Electrical Commissioning																					100	100	80	
Close Out																							80	80
Estimated Vehicles Per Month	**250**	**250**	**250**	**20**	**20**	**20**	**342.9**	**459.6**	**255.4**	**307.4**	**119.2**	**119.2**	**251.2**	**349.6**	**255.5**	**250.5**	**300.6**	**300.6**	**298**	**22.05**	**122.1**	**104.2**	**256.1**	**151**
Estimated Vehicles Per Week	**62.5**	**62.5**	**62.5**	**5**	**5**	**5**	**85.72**	**114.9**	**63.84**	**76.84**	**29.81**	**29.81**	**62.81**	**87.4**	**63.86**	**62.61**	**75.15**	**75.15**	**74.49**	**5.513**	**30.51**	**26.05**	**64.02**	**37.7**
Estimated Vehicles Per Day (5.5 days)	**11**	**11**	**11**	**1**	**1**	**1**	**16**	**21**	**12**	**14**	**5**	**5**	**11**	**16**	**12**	**11**	**14**	**14**	**14**	**1**	**6**	**5**	**12**	**7**
Peak Daily Vehicles	**15**																							
Peak Hourly Vehicles	**1.875**																							
Average Daily Vehicles	**10**																							
Average Hourly Vehicles	**1**																							

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6: Surveyed Traffic associated with Existing Development Site Use

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Drumdowney Solar Farm - Existing Traffic Associated with Development Site

	Activity	Vehicle Type	Farm A	Farm B	Farm C	Farm D	Farm E	Farm F	Total Trips (52 weeks)
1	Ploughing	4-wheel tractor and plough	4	1	9	0	2	2	**18**
2	Cultivating	4-wheel drive tractor, trailer and attachments	6	1	21	4	0	80	**112**
3	Harvesting	4-wheel drive tractor, trailer and attachments	160	27	36	40	1	70	**334**
4	Extraction	4-wheel drive tractor, 20 tonne twin axle truck and loading shovels	65	0	20	0	0	10	**95**
5	Spraying	4-wheel drive tractor with spraying attachments	4	44	12	3	0	6	**69**
6	Slurry Spreading	4-wheel drive tractor with slurry tanker	50	27	66	250	2	100	**495**
7	Milk Collection	Articulated Lorry	0	0	0	150	0	200	**350**
8	Bulk Deliveries	Articulated Lorry	11	0	42	35	0	50	**138**
9	Animal Movement	4-wheel drive tractor, trailer and attachments	0	24	10	0	0	0	**34**
10	Vet Visits	Car or Van	0	0	10	0	0	0	**10**
								Total	**1655**