Achany Extension Wind Farm

Technical Appendix 13.1: Transport Assessment

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1 INTRODUCTION

1.1 Tetra Tech was commissioned by SSE Renewables ("the Applicant") to undertake an assessment of the transport aspects of the proposed Achany Extension Wind Farm, hereafter referred to as the 'Proposed Development'.

1.2 The Proposed Development is located in Sutherland to the west of Lairg and is adjacent to Achany Wind Farm which began operation in 2010.

1.3 This Transport Assessment (TA) identifies the key transport and access matters associated with the Proposed Development, including the proposed routing for construction traffic including abnormal loads. The TA identifies the predicted number and distribution of construction traffic movements and details where mitigation measures are required to accommodate the proposed movements.

1.4 The TA considers the impacts during the construction phase of the Proposed Development, when volumes of traffic generation are anticipated to be at their greatest due to the delivery of equipment and construction materials. In line with IEMA guidelines, severance, driver delay, pedestrian delay, pedestrian amenity, fear and intimidation as well as accidents and safety have been evaluated in isolation for the Proposed Development and are discussed in Chapter 13 of the Environmental Impact Assessment Report (EIA Report). Additionally, these receptors were evaluated cumulatively considering other committed and in-planning wind farms to produce a worst-case scenario. The operational phase of the Proposed Development is not anticipated to have any significant impacts on the public road network as a result of the low levels of traffic that are forecast.

1.5 All turbine loads would originate from either Nigg or Invergordon and access the Proposed Development via the A9 to Loch Fleet then the A839 passing through Lairg before entering the Proposed Development entrance from the east through the existing Achany Wind Farm access junction. An Abnormal Load Route Assessment has been undertaken and is included as Technical Appendix 13.2. General construction traffic is likely to approach the Proposed Development from the A839 west of Lairg and A836 and A949 south of Lairg from the A9.

1.6 This TA has been prepared in accordance with instructions from the Applicant on the above project details. No liability is accepted for the use of all or part of this report by third parties.

Report Structure

1.7 Following this introductory chapter, the TA is structured as follows:

- **Chapter Two** describes the Proposed Development along with details of the proposed abnormal loads;
- **Chapter Three** sets out details of relevant local and national policy and guidance;
- **Chapter Four** sets out the assessment stages considered within the TA;
- **Chapter Five** details the baseline transport conditions encountered within the study area;
- **Chapter Six** sets out estimates of development traffic flows**;**
- **Chapter Seven** provides details of the traffic impact assessment;
- **Chapter Eight** sets out construction traffic management proposals; and
- **Chapter Nine** summarises the findings of the Transport Assessment and outlines the key conclusions.

2 PROPOSED DEVELOPMENT

Site Description

2.1 The Proposed Development would include the following key components:

- Up to twenty wind turbines of up to 149.9m tip height with internal transformers;
- Crane hardstanding and associated laydown area at each wind turbine location;
- On site access tracks (of which approximately 17.3km are new access tracks and approximately 6.6km are existing tracks where upgrades may be required to facilitate delivery of the wind turbine components);
- A new on-site substation, welfare building and store;
- Extension to the existing operations building at Achany Wind Farm to accommodate additional staff;
- A network of underground cabling to connect each wind turbine to the on-site substation;
- A LiDAR unit to collect meteorological and wind speed data, and associated hard stand; and
- Any associated ancillary works required.

2.2 In addition to the permanent components, the construction phase would comprise the following temporary facilities:

- Site compound areas, including welfare facilities, site cabins, and parking;
- Batching plant facilities for on-site concrete production.
- Temporary telecommunications infrastructure; and
- Borrow pits, comprising both new and reworking of a borrow pit previously used during the construction of Achany Wind Farm.

2.3 Access to the Proposed Development is proposed via the existing junction to Achany Wind Farm on the A839, located to the west of Lairg. It is anticipated that all construction traffic will access the Proposed Development from the east on the A839.

2.4 The location of the Proposed Development is indicated in Figure 13.2.

Proposed Turbine Details

2.5 The 20 turbines proposed as part of the development would have a tip height of up to 149.9m and a rotor diameter of up to 136m.

2.6 The Applicant indicated that they wish to consider access for up to 67m long blade turbines being transported to the Proposed Development.

2.7 A Route Survey Assessment is included in Technical Appendix 13.2 and considers a 67m long Vestas V136 blade with tower loads up to 29.96m in length and up to 4.3m wide, considered to provide a worst-case assessment scenario for a variety of different options.

3 POLICY CONTEXT

Introduction

3.1 A review of relevant transport and planning policies has been undertaken and is summarised below. The review provides the basis for the wider development context of wind farm proposals.

National Policy

Scottish National Planning Framework (NPF)

3.2 The Scottish National Planning Framework (NPF) sets the context for development planning in Scotland and provides a framework for the spatial development of Scotland as a whole. It sets out the Government's development priorities over the next 20-30 years and identifies national developments which support the development strategy. Scotland's third National Planning Framework 3 was laid in the Scottish Parliament on June 23, 2014.

Scottish Planning Policy (2020)

3.3 In relation to transport and access matters, SPP notes:

"286. Where a new development or a change of use is likely to generate a significant increase in the number of trips, a transport assessment should be carried out. This should identify any potential cumulative effects which need to be addressed; and

290. Development proposals that have the potential to affect the performance or safety of the strategic transport network need to be fully assessed to determine their impact. Where existing infrastructure has the capacity to accommodate a development without adverse impacts on safety or unacceptable impacts on operational performance, further investment in the network is not likely to be required. Where such investment is required, the cost of the mitigation measures required to ensure the continued safe and effective operation of the network will have to be met by the developer."

Planning Advice Note (PAN) 75

3.4 PAN75: Planning for Transport provides advice on the requirements for Transport Assessments as follows:

"[…] requires a transport assessment to be produced for significant travel generating developments. Transport Assessment is a tool that enables delivery of policy aiming to integrate transport and land use planning."

"All planning applications that involve the generation of person trips should provide information which covers the transport implications of the development. The level of detail will be proportionate to the complexity and scale of the impact of the proposal...For smaller developments the information on transport implications will enable local authorities to monitor potential cumulative impact and for larger developments it will form part of a scoping exercise for a full transport assessment. Development applications will therefore be assessed by relevant parties at levels of detail corresponding to their potential impact."

Onshore Wind Turbines: Online Renewables Planning Advice (May 2014)

3.5 The Scottish Government introduced online renewables advice in February 2011 which has been regularly updated since then. The most recent specific advice note regarding onshore wind turbines was published in May 2014. The advice note identifies the typical planning considerations in determining applications for onshore wind turbines including landscape impact, impacts on wildlife and ecology, shadow flicker, noise, ice throw, aviation, road traffic impacts, cumulative impacts and decommissioning.

3.6 In terms of road traffic impacts, the guidance notes that in siting wind turbines close to major roads, pre-application discussions are advisable. This is particularly important for the movement of large components (abnormal load routing) during the construction period, periodic maintenance and for decommissioning.

Transport Assessment Guidance (2012)

3.7 Transport Scotland's (TS) Transport Assessment Guidance was published in 2012. It aims to assist in the preparation of Transport Assessments (TA) for development proposals in Scotland such that the likely transport impacts can be identified and dealt with as early as possible in the planning process. The document sets out requirements according to the scale of development being proposed.

3.8 The document notes that a TA will be required where a development is likely to have significant transport impacts but that the specific scope and contents of a TA will vary for developments, depending on location, scale and type of development.

Guidelines for the Environmental Assessment of Road Traffic, IEMA (1993)

3.9 The document includes guidance on how the sensitivity of receptors should be assessed, contains rules to help determine which links in the study area should be considered for detailed assessment and identifies the key impacts that are most important when assessing the magnitude of traffic effects from an individual development.

Local Policy

The Highland Council (THC) Local Transport Strategy (LTS), 2010

3.10 The document refers to the road network across rural areas being characterised by '*winding single carriageway roads with passing places*'. Reference is also made to the additional pressure that can be placed on sub-standard roads. The LTS notes that in terms of timber transport, there are initiatives such as tyre pressure moderation which are reducing the damaging effect of forestry lorries on rural roads. The LTS also mentions the many bridges which are subject to weight restrictions in the Local Authority area. The LTS states that "*where possible, the Council, through its Lifeline Bridges programme will invest in the bridges to maintain access either by removing weight restrictions or reducing the weight restriction effect of HGV vehicles*." The aim of the Lifeline Bridges

programme is to assist the economy of the area by allowing the efficient transport of essential goods and services and also providing for industries that are heavily dependent on large vehicle transport.

4 ASSESSMENT STAGES

4.1 There are three stages that this assessment considers:

- The Construction Phase of the project;
- The Operational Phase of the project; and
- The Decommissioning Phase of the project.

4.2 Of these phases, the greatest traffic volumes are associated with the project construction phase. The operational phases are restricted to occasional maintenance operations which generate much lower volumes of traffic that are not considered to be more than daily traffic variation levels on the road network.

4.3 The decommissioning phase involves fewer trips on the network than the construction phase, as elements of infrastructure such as access tracks are often left in place, adding to local infrastructure.

4.4 The 'worst case' transport scenario is therefore the construction phase and this assessment concentrates on this phase of the Proposed Development. It should be noted however that the construction effects are short lived and temporary in nature.

5 BASELINE CONDITIONS

Road Network

5.1 The road network included in the assessment was identified through an assessment of the likely routes between suppliers of equipment and materials and the Proposed Development. Roads forming the study area are shown in Figure 13.2 and include:

- A839 between Loch Fleet and the Proposed Development;
- A836 between Tarlogie and Lairg;
- A949 between Clashmore and Bonar Bridge; and
- A9 between Invergordon and Loch Fleet.

5.2 A brief summary of the characteristics of each section of road is provided below:

- The A839 is a two-way rural single carriageway road subject to the national speed limit except where it passes through settlements including Lairg and Pittentrail where the speed limit reduces to 30mph. The road provides access to small hamlets and dwellings in the study area and provides access to Lairg from both the east and west. West of Lairg between the junction with the B864 and the Proposed Development the A839 is of varying width including sections of single track with passing places.
- The A836 is a two-way rural single carriageway road subject to the national speed limit except where it passes through settlements including Ardgay, Bonar Bridge and Lairg where the speed limit reduces to 30mph. The road provides access to small hamlets and dwellings in the study area and provides access to Lairg from both the north and south.
- The A949 is a two-way rural single carriageway road subject to the national speed limit except where it passes through settlements including Bonar Bridge where the speed limit reduces to 30mph. The road provides access to small hamlets and dwellings in the study area and provides an alternative access to Bonar Bridge along the northern edge of the Dornoch Firth.

- The A9 is strategic trunk roads managed by Transport Scotland and its managing agent Bear Scotland. The A839, A836 and A949 are local roads managed by The Highland Council (THC).

Data Collection Methodology

5.3 The UK coronavirus lockdown commenced on the 23 March 2020 with various restrictions on movement in place for the majority of 2020 with an associated impact on traffic flows within the Study Area. To ensure a robust assessment of the likely impacts during the construction phase, 2019 Annual Average Daily Traffic Flow data was extracted from the online Department for Transport (DfT) database of count sites located within the Study Area.

5.4 The area of the Proposed Development has not seen any significant growth in recent years therefore the DfT count sites are believed to provide an accurate representation of existing road usage without the risk of commissioning surveys that may result in misrepresentative traffic flows compared to usual conditions because of the current global pandemic.

5.5 To determine the existing road usage, 2019 Annual Average Daily Traffic Flow (AADT) data for seven sites was extracted from the online DfT database of count sites. The locations of the traffic count sites are illustrated on Figure 13.2 and are as follows:

1. A9 between Invergordon and Tain (DfT 20724);
2. A9 between Tain and Dornoch Firth Bridge (south side) (DfT 30723);
3. A836 between Dornoch Firth Bridge (south side) and Bonar Bridge (DfT 80004);
4. A9 between Dornoch Firth Bridge (south side) and The Mound (DfT 30722);
5. A839 between The Mound and Lairg (DfT 20935);
6. A836 between Bonar Bridge and Lairg (DfT 20934);
7. A839 between Lairg and the Proposed Development Junction (DfT 50934); and
8. A949 between the Clashmore and Bonar Bridge (DfT 8006).

Existing Traffic Conditions

5.6 The traffic counters allowed the traffic flows to be split into vehicle classes and the data has been summarised into cars/ light goods vehicles (Lights) and HGVs (all goods vehicles >3.5 tonnes gross maximum weight).

5.7 Table 5.1 summarises the 24-hour average daily traffic data collected at the count sites.

Table 5.1 Existing Traffic Movements (Daily Average Two-way Flows)

Count Location	Cars/ Lights	HGV	Total
A9 between Invergordon and Tain (DfT 20724)	10012	732	10744
A9 between Tain and Dornoch Bridge (DfT 30723)	7275	589	7864
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	548	164	712
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4004	335	4339
A839 between The Mound and Lairg (DfT 20935)	831	40	871
A836 between Bonar Bridge and Lairg (DfT 20934)	986	87	1073
A839 between Lairg and the Proposed Development Junction (DfT 50934)	265	98	363
A949 between Clashmore and Bonar Bridge (DfT 20935)	830	40	870

Baseline Traffic Conditions

5.8 Construction of the Proposed Development is likely to take 18 months with the peak period potentially falling during 2025, depending if and when consent is granted.

5.9 Any lengthening in the construction programme for the Proposed Development would have a reduced effect on the surrounding road network in peak period trip generation terms.

5.10 Future year baseline traffic flows were determined by applying a National Road Traffic Forecast (NRTF) 2025 high growth factor to the existing traffic flows within the study area, the year where construction traffic is projected to be at its peak. Traffic flows associated with nearby operational wind farms were captured within the existing traffic flows.

5.11 The NRTF high growth factor for 2019 to 2025 is 1.0808. This factor was applied to the 2019 DfT data and to estimate the 2025 traffic flows. The resulting future year baseline traffic flows are shown in Table 5.2.

Table 5.2 Future Year Baseline Traffic (Weekday Average Two-way Flows)

Count Location	Cars/ Lights	HGV	Total
A9 between Invergordon and Tain (DfT 20724)	10821	791	11612
A9 between Tain and Dornoch Bridge (DfT 30723)	7863	637	8499
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	592	177	770
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4328	362	4690
A839 between The Mound and Lairg (DfT 20935)	898	43	941
A836 between Bonar Bridge and Lairg (DfT 20934)	1066	94	1160
A839 between Lairg and the Proposed Development Junction (DfT 50934)	286	106	392

A949 between Clashmore and Bonar Bridge (DfT 20935)	897	43	940

Accident History

5.12 Road traffic accident data obtained from the web resource http://www.crashmap.co.uk for the study area roads covering the five years to the end of 2019 over a study area comprising the road network indicated in Figure 13.2.

5.13 The data is collected by the police about road traffic crashes occurring on British roads where someone is injured with the severity of injury defined as follows:

- Slight – minor injury treated at the scene;
- Serious – injury for which the person is detained in hospital; and
- Fatal – the person dies within 30 days of the accident.

5.14 The data indicated that over the network reviewed, which is approximately 130km in length, an average of 13 accidents occur every year of which 82% are classified as "slight", 13% as "serious" and 5% as "fatal" by the police officer(s) reporting and recording the personal injury accident.

5.15 Table 5.4 summarises the accident data.

Table 5.4 Accident Data Summary 2014-2019

Severity of Accident	Slight	Serious	Fatal	TOTAL
A9 - Tain to The Mound	35	7	2	**44**
A839 - The Mound to Lairg	6	0	0	**6**
A836 - Dornoch Firth Bridge to Lairg	9	1	1	**11**
A949 - Clashmore to Bonar Bridge	6	1	0	**7**

5.16 The A9 / B9174 Junction presents an area where 18 accidents were recorded accounting for 26% of the total, these accidents were all classified as 'slight'. No common cause or accident location has been identified in the analysis that would point to a specific road safety issue on the rest of the network reviewed.

Footpath and Cycle Network

5.17 A review of foot and cycle paths that may be affected by the movement of construction traffic was undertaken. THC's Interactive Core Paths Map indicates the following Core Paths in close proximity to the Proposed Development:

- Sika Trail Cycle Route SU21.02 – off-road cycle route following the Rosehall Wind Farm access track north of the B839 around 1.5km west of the Site access;
- Braemore – Achany SU16.08 – unsurfaced track linking Achany to the A839 approximately 1.5km east of the Site Achany Wind Farm access junction; and
- Gruids Wood Track SU16.09 – unsurfaced track linking the A839 and B864 approximately 3km east of the Site access, Achany Wind Farm access junction.

5.18 There are no core paths or other formal footpaths within the Site or in proximity that would be affected by traffic movements associated with the Proposed Development as none of these paths cross roads which will be utilised by construction traffic.

5.19 The A836 east of Ardgay and A839 within Lairg also form part of National Cycle Route 1 (NCR1).

6 DEVELOPMENT TRIPS

Derivation of Development Traffic Flows

6.1 During the 18-month construction period, the following traffic would require access to the Proposed Development:

- Staff transport, either cars or staff minibuses;
- Construction equipment and materials, deliveries of machinery and supplies such as cement materials; and
- Abnormal loads consisting of the wind turbine sections and a heavy lift crane.

6.2 Average monthly traffic flow data were used to establish the construction trips associated with the Proposed Development based on the assumptions detailed in the following sections.

Staff Traffic

6.3 Staff would arrive in non-HGV vehicles and where possible would be encouraged to car share. The workforce on-site would depend on the activities undertaken, but, based on previous wind farm construction site experience; the maximum number is expected to be around 48 per day during the peak of construction.

6.4 For the purposes of this assessment, it is assumed that all staff and construction traffic will be generated from outside the traffic and transport Study Area. This is a conservative assumption as it is likely that some staff will originate within the traffic and transport Study Area such as Lairg or Tain and their movements will not therefore impact on all roads under consideration.

6.5 Based on the distribution of local population centres and settlements surrounding the study area, 85% of staff trips were assumed to originate from towns accessed via the A9 south of the Dornoch Firth, such as Inverness with 15% via the A9 north of the Dornoch Firth.

General Construction Traffic

6.6 An estimate of cement, sand and steel reinforcement requirements for the turbine foundations was based on experience of previous developments. It was assumed that concrete would be batched on-site which reduces the vehicle movements required for deliveries by approximately one third compared with use of ready-mix concrete. The total estimated trips required for the delivery of the concrete and steel reinforcement is summarised in Tables 6.1, 6.2 and 6.3.

Table 6.1: Turbine Aggregate Deliveries

Material	Total Volume (m^3)	Lorry Capacity (m^3)	Number of Lorries	Number of movements
Aggregate	5760	20	461	922

Table 6.2: Concrete Sand Deliveries

Material	Total Weight (m^3)	Lorry Capacity (m^3)	Number of Lorries	Number of movements
Sand	3600	20	288	576

Table 6.3: Steel Reinforcement Deliveries

Material	Total Weight (Tonnes)	Lorry Capacity (Tonnes)	Number of Lorries	Number of movements
Steel Reinforcement	1672.2	30	56	112

6.7 Based on information available from an initial assessment of available stone combined with experience from the previous construction of Achany Wind Farm, it is assumed that the majority of stone material (80% of the total volume) will be delivered from on-site borrow pits. An exception has been made for higher quality aggregate materials required to construct the wearing course of access tracks, crane hardstandings (20% of the total volume) which will be sourced from off-site quarries. It is considered that this provides a robust methodology should it not be possible to source all the required stone material from on-site

borrow pits. The total estimated trips required for the delivery of imported stone is summarised in Tables 6.4.

Table 6.4: Imported Stone Deliveries

Material	Total Weight (m^3)	Total (te)	Lorry Capacity (te)	Number of Lorries	Number of movements
Imported Stone	50000	100000	20	5000	10000

6.8 An allowance has also been made for the laying of a geotextile membrane along the length of the track network. The total estimated trips are summarised in Table 6.5.

Table 6.5: Geotextile Membrane Deliveries

Material	Total Length per drum (m)	Number of Drums	Lorry Capacity (Drums) / No Lorries	Number of movements
Geotextile Membrane	75	231	20 / 12	24

6.9 Electrical cables would be laid in trenches along the access track between the turbine locations and the on-site substation. The cables would be buried in sand to protect them from damage. Cabling sand would be imported to the Proposed Development. The total estimated number of trips required to deliver the electrical cables and cabling sand is summarised in Tables 6.6 and 6.7.

Table 6.6: Cabling Movements

Material	Total Cable Length (m)	Length per drum / Number of Drums	Drums per Lorry / No Lorries	Number of movements
Electrical Cabling	17300	500 / 35	9 / 4	8

Table 6.7: Cabling Sand Movements

Material	Total Volume (m^3)	Density (te) / Lorry Capacity (m^3)	Number of Lorries	Number of movements
Cabling Sand	5839	1.6 / 20	468	936

6.10 It was assumed that there would be one service delivery (food/drink) per working day throughout the 18-month programme. This equates to 40 vehicle movements per month (20 trips inbound and 20 trips outbound).

6.11 It was assumed that construction would take place over a 20 working day month.

Turbine Transport

6.12 The turbines are broken down into components for transport to the Proposed Development. The hub, nacelle, drive train and blade and tower sections are classified as Abnormal Indivisible Loads (AIL) due to their weight, length, width and height when loaded.

6.13 For the purposes of the report, the worst-case numbers of components requiring transport are illustrated in Table 6.8. It should be noted that the actual turbines installed on the Proposed Development may have fewer tower sections, resulting in fewer loads being transported.

Table 6.8: Turbine Component Deliveries

Component	Maximum No. Per Turbine
Rotor Blades	3
Tower Sections	4
Nacelle	1
Hub	1
Drive Train	1
Container	1
Nose Cone	1
Footings	1

Site Parts	0.2
Total movements	13.20
Number of turbines	20
Total vehicle movements	**264**

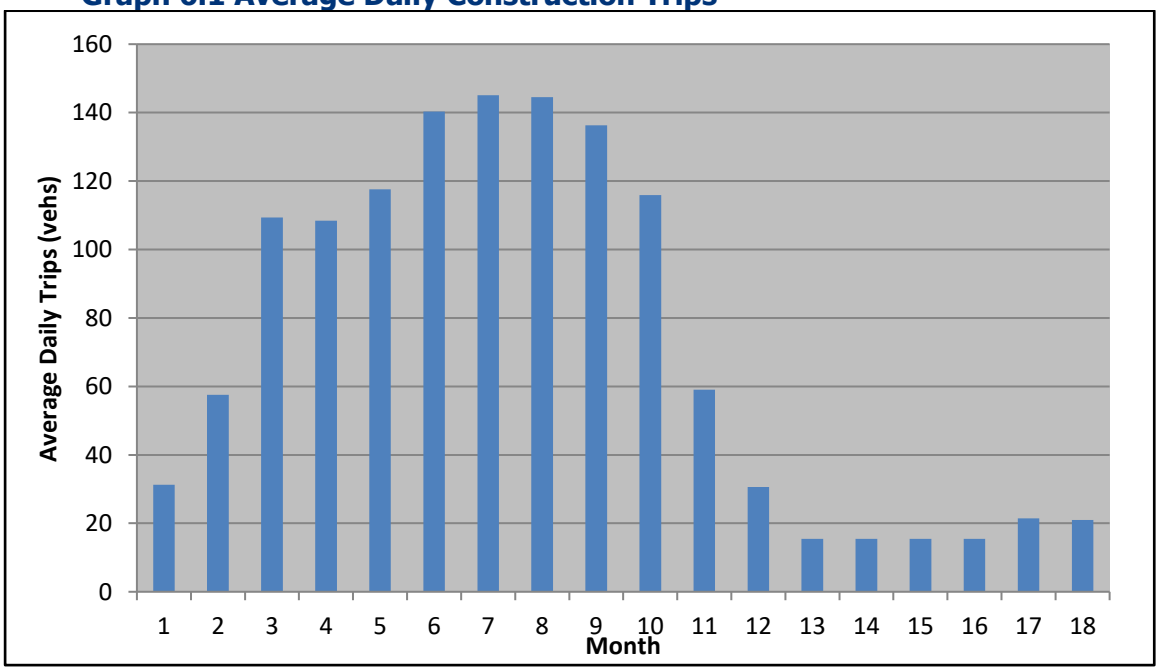
6.14 In addition to the turbine deliveries, two high capacity erection cranes would be needed to offload some components and erect the turbines. The cranes are likely to be mobile cranes with a capacity up to 1,000 tonnes that are escorted by boom and ballast trucks to allow full mobilisation on-site. Smaller erector cranes would also be present to allow the assembly of the main cranes and to ease the overall erection of the turbines.

Total Construction Traffic

6.15 The total estimated construction traffic movements are detailed in the main delivery schedule table provided in Appendix A of this report.

6.16 The average daily construction trips across the construction programme is illustrated in Graph 6.1.

Graph 6.1 Average Daily Construction Trips



Development Traffic Distribution

6.17 The origin of vehicle traffic would depend on the location of staff accommodation and the source of materials being imported. It is likely that staff would be accommodated across a wide area.

6.18 The highest volume of construction traffic would be generated by the requirement for concrete source materials and stone associated with the access track construction, elements of which would be imported. There are several potential sources of suitable materials near the Proposed Development including Breedon Ardchronie Quarry and Pat Munro Dornoch Bridge Quarry.

6.19 General construction HGV traffic is assumed to use the A836 and A949 from their respective junctions with the A9 then access the Proposed Development from the east via the A839 making a right turn. All HGV traffic would only use the A839 to the east of the access and would be forced to turn left out of the Proposed Development due to the low standards of the road network to the west. The choice of HGV route was based on identifying the most suitable route between the Site access and the primary Trunk or A-Class road network. It is considered unlikely that HGV traffic will utilise the A839 to the east of Lairg as the majority of construction materials will be sourced from the A9 to the south.

6.20 Due to the similar journey times and distances on the A836 and A949 routes between the A9 and Bonar Bridge it has been assumed that 100% of the assumed HGV distribution will approach from the south on the A9. This has then been applied to each route in order to provide a robust assessment. It should be noted that the closest sources of materials, Ardchronie Quarry and Dornoch Bridge Quarry are located within the study area and that the selection of materials supplier prior to construction will impact on the final traffic distribution.

6.21 All turbine blade loads would originate from Invergordon or Nigg and access the Proposed Development via the A9 to Loch Fleet then the A839 to Lairg before following the same route as HGV traffic.

6.22 All traffic distribution assumptions are shown in Table 6.9.

Table 6.9 Construction Traffic Distribution Assumptions

Road	Staff	Turbine Transport/Escorts	Cranes	Aggregate/Sand/Cement	Other
A9 between Invergordon and Tain (DfT 20724)	85%	100%	100%	100%	100%
A9 between Tain and Dornoch Bridge (DfT 30723)	85%	100%	100%	100%	100%
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	85%	100%	100%	100%	100%
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	0%	100%	100%	0%	0%
A839 between The Mound and Lairg (DfT 20935)	15%	0%	0%	0%	0%
A836 between Bonar Bridge and Lairg (DfT 20934)	100%	100%	100%	100%	100%

Conclusions

6.23 The results conclude that the peak period of construction is anticipated to occur during months 7-8 of the 18-month programme. This corresponds with the delivery of materials for track construction, concrete production for turbine foundations and commencement of turbine deliveries. During the busiest months, activities are anticipated to generate an average of 145 two-way vehicle trips per day of which 45 would be made by LGV (site staff) and 93 by HGV.

The traffic impact assessment focuses on the peak period traffic flows to illustrate the potential impacts on the study network.

7 TRAFFIC IMPACT ASSESSMENT

Construction Traffic

7.1 The future year baseline traffic data was combined with the peak daily construction traffic flows to estimate the total trips on the study network during the peak of the construction phase. This was then distributed across the network.

7.2 Table 7.1 illustrates the peak weekday construction traffic flow; Table 7.2 the weekday and future year baseline plus peak construction traffic (total) flows and Table 7.3 the percentage increase in total traffic over baseline traffic.

Table 7.1: Peak Construction Traffic (Weekday Average Two-Way Flows)

Count Location	Cars/ Lights	HGV	Total
A9 between Invergordon and Tain (DfT 20724)	45	93	138
A9 between Tain and Dornoch Bridge (DfT 30723)	45	93	138
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	45	93	138
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4	4	8
A839 between The Mound and Lairg (DfT 20935)	12	4	16
A836 between Bonar Bridge and Lairg (DfT 20934)	45	93	138
A839 between Lairg and Proposed Development Junction (DfT 50934)	52	93	145
A949 between Clashmore and Bonar Bridge (DfT 20935)	45	92	137

Table 7.2: Total Traffic Flows (Weekday Average Two-Way Flows)

Count Location	Cars/ Lights	HGV	Total
A9 between Invergordon and Tain (DfT 20724)	10866	884	11750
A9 between Tain and Dornoch Bridge (DfT 30723)	7908	730	8637
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	637	270	908
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4332	366	4698
A839 between The Mound and Lairg (DfT 20935)	910	47	957
A836 between Bonar Bridge and Lairg (DfT 20934)	1111	187	1298
A839 between Lairg and Proposed Development Junction (DfT 50934)	338	199	537
A949 between Clashmore and Bonar Bridge (DfT 20935)	942	135	1077

Table 7.3: Percentage Increase Total vs Future Year Baseline (Weekday Average Two-Way Flows)

Count Location	Cars/ Lights	HGV	Total
A9 between Invergordon and Tain (DfT 20724)	0.42%	11.76%	1.19%
A9 between Tain and Dornoch Bridge (DfT 30723)	0.57%	14.61%	1.62%
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	7.60%	52.47%	17.93%
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	0.09%	1.10%	0.17%
A839 between The Mound and Lairg (DfT 20935)	1.34%	9.25%	1.70%
A836 between Bonar Bridge and Lairg (DfT 20934)	4.22%	98.91%	11.90%
A839 between Lairg and the Proposed Development Junction (DfT 50934)	18.16%	87.80%	36.96%
A949 between Clashmore and Bonar Bridge (DfT 20935)	5.02%	212.81%	14.57%

7.3 It is anticipated that should any weekend working take place, it would involve limited numbers of staff and associated vehicle movements including deliveries by HGVs; no detailed analysis has therefore been undertaken.

7.4 The results in Table 7.3 indicate that during construction of the Proposed Development, neither total nor HGV traffic flows are predicted to increase by more than 30% on the A9 or A839 east of Lairg.

7.5 During construction of the Proposed Development, total traffic movements may temporarily increase by more than 30% on the A839 between Lairg and Proposed Development with HGV movements increasing by more than 50% on the A836 between Dornoch Firth Bridge and Lairg, on the A949 between Clashmore and Bonar Bridge and between Lairg and the Proposed Development.

7.6 In real terms, the maximum number of additional HGV movements per hour on any link averages less than 12 within the peak month of construction activity assuming an 8 hour working day.

7.7 This volume of additional traffic is not considered to present a concern in terms of the link capacity.

Operational Traffic

7.8 It is predicted that during the operation of the Proposed Development (expected to be for 50 years from commissioning) there would be an average of 2 vehicle movements per week for maintenance purposes. Also, there may be occasional abnormal load movements to deliver replacement components in the unlikely event of a major failure.

Decommissioning Traffic

7.9 Prior to decommissioning of the Proposed Development, a traffic assessment would be undertaken, and appropriate traffic management procedures followed. It is anticipated that the number of associated movements would be less than during the construction phase and that the number of abnormal loads would be drastically reduced.

Cumulative Assessment

7.10 Consideration was given to the cumulative impact of the Proposed Development in combination with other developments that are both committed and subject to planning approval which would impact on the study area. It was considered that committed developments, Lairg 2, Creag Riabhach and Braemore Wind Farms should be included in the assessment. There are a number of other wind farm sites in the area currently subject to planning applications including Sallachy,

Meal Buidhe and Garvary Wind Farms. These sites have not been included due to a lack of certainty over whether they would be consented alongside the lack of clarity associated with the future delivery timetable for each site.

7.11 It is considered highly unlikely that the construction programmes for the Proposed Development and the identified wind farms would coincide due to supply chain constraints associated with the supply of materials and in particular the shipping and storage of turbine components and associated availability of police escorts for the transport of turbine components. This is particularly relevant with regard to the shipping and delivery of turbine components which are likely to utilise similar Ports of Entry with associated storage constraints noting that Police Scotland will restrict the timing of convoy movements based on available resources. However, for the purposes of this assessment it was assumed that the peak periods of the construction programmes would overlap and as such, the cumulative assessment has considered the worst-case scenario.

7.12 Peak period traffic flows for the cumulative developments were extracted from planning documentation and added to the future year flows where they impact on the study area. No transport information was available in relation to Braemore Wind Farm and it has therefore been assumed that traffic flows would be similar to the Proposed Development.

7.13 Table 7.4 illustrates the weekday traffic flows associated with the three cumulative developments, Table 7.5 the Total Cumulative Traffic Flows (baseline traffic plus proposed development and cumulative wind farms) and Table 7.6 the percentage increase in cumulative traffic over baseline traffic.

Table 7.4: Cumulative Development Peak Construction Traffic (Weekday Average Two-Way Flows)

Survey Location	Cars/ Lights	HGV	Total
A9 between Invergordon and Tain (DfT 20724)	93	114	207
A9 between Tain and Dornoch Bridge (DfT 30723)	93	114	207

A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	60	92	152
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	66	26	91
A839 between The Mound and Lairg (DfT 20935)	71	26	97
A836 between Bonar Bridge and Lairg (DfT 20934)	60	92	152
A839 between Lairg and the Proposed Development Junction (DfT 50934)	35	65	100
A949 between Clashmore and Bonar Bridge (DfT 20935)	60	67	128

Table 7.5: Total Cumulative Traffic Flows (Weekday Average Two-Way Flows)

Survey Location	Cars/ Lights	HGV	Total
A9 between Invergordon and Tain (DfT 20724)	10959	998	11957
A9 between Tain and Dornoch Bridge (DfT 30723)	8001	844	8845
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	698	362	1060
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	4397	392	4789
A839 between The Mound and Lairg (DfT 20935)	981	73	1054
A836 between Bonar Bridge and Lairg (DfT 20934)	1171	279	1450
A839 between Lairg and the Proposed Development Junction (DfT 50934)	373	264	637

A949 between Clashmore and Bonar Bridge (DfT 20935)	1002	203	1205

Table 7.6: Percentage Increase Cumulative vs Future Year Baseline (Weekday Average Two-Way Flows)

Survey Location	Cars/ Lights	HGV	Total
A9 between Invergordon and Tain (DfT 20724)	1.28%	26.16%	2.97%
A9 between Tain and Dornoch Bridge (DfT 30723)	1.76%	32.52%	4.06%
A836 between Dornoch Firth Bridge and Bonar Bridge (DfT 80004)	17.78%	104.37%	37.72%
A9 between Dornoch Firth Bridge and The Mound (DfT 30722)	1.61%	8.23%	2.12%
A839 between The Mound and Lairg (DfT 20935)	9.25%	68.92%	11.99%
A836 between Bonar Bridge and Lairg (DfT 20934)	9.88%	196.75%	25.03%
A839 between Lairg and the Proposed Development Junction (DfT 50934)	30.38%	149.17%	62.45%
A949 between Clashmore and Bonar Bridge (DfT 20935)	11.74%	368.48%	28.14%

7.14 The results indicate that when considering the cumulative construction phases both the Total traffic and HGV flows are predicted to temporarily increase on all links within the study area including large increases on the A836, A949 and A839.

7.15 Before the introduction of mitigation, it is considered that significant effects considered to be major in relation to pedestrian amenity would arise for users of

A836, A949 and within Bonar Bridge resulting from the cumulative impact of HGV construction traffic movements from the Proposed Development and cumulative developments.

7.16 The effects would be temporary and short lived during the construction phase, the road is not close to capacity and pedestrian movements are not observed to be high with limited pedestrian infrastructure.

7.17 It is recommended that should cumulative construction phases occur concurrently that enhanced CTMP mitigation measures are introduced within Bonar Bridge and Lairg in order to reduce the impact of increased HGV movements.

7.18 In relation to the A839, while it is unlikely that the peak months of construction would clash across both developments, it is likely that there will be combined HGV traffic across both developments using this road throughout their construction programmes should these coincide. Without consideration of prior improvement work, this road may be unable to be able to safely accommodate the anticipated combined peak two-way movement of HGV traffic due to its constrained nature with a number of sections of single track. This can be mitigated through the implementation of CTMPs associated with each individual development and a further assessment of the suitability of existing passing place locations on the A839 prior to construction.

8 OUTLINE CONSTRUCTION TRAFFIC MANAGEMENT PROPOSALS

8.1 This Chapter identifies the high-level proposals for managing the effects of vehicles associated with the proposed development during construction that would be incorporated into a site specific CTMP. The CTMP would be based on the proposals identified within this chapter should the proposed development be granted planning consent and when a contractor is appointed. A CTMP is intended to be a working document that evolves during the construction period.

Construction Phase

8.2 During the construction period, a community liaison group will be set up to disseminate information and take feedback and a project website will be set up and regularly updated to provide the latest information relating to traffic movements associated with vehicles accessing the Proposed Development. This will be agreed with THC.

8.3 Information would also be provided relating to expected abnormal load convoy movements from Nigg or Invergordon through to the Proposed Development access. It is hoped that this level of information will make residents aware of convoy movements and help reduce any potential conflicts.

8.4 All construction deliveries would be undertaken at appropriate times (to be discussed and agreed with the relevant roads authorities and police) with the aim to minimise the effect on the local road network. It is likely that the abnormal load convoys would travel in the early morning periods, before peak times while general construction traffic would generally avoid the morning and evening peak periods.

8.5 The following measures will be implemented during the construction phase through the CTMP:

- All materials delivery lorries (dry materials) will be sheeted to reduce dust and stop spillage on public roads;

- Specific training and disciplinary measures will be established to ensure the highest standards are maintained to prevent construction vehicles from carrying mud and debris onto the carriageway;
- Wheel wash facilities will be established at the Proposed Development entrance;
- Working hours will be limited to between 0700 and 1900 Monday to Friday and 0700 to 1400 on Saturdays except for abnormal load component delivery which could take place outside these hours;
- Avoidance of transit through the rural communities identified during arrival and departure times of school buses with all construction traffic following the designated access route from the A836 / A949 / A839;
- Police escorts will be utilised for the movement of abnormal loads with the aim of having several vehicles in convoy to minimise the disruption caused to road users. Abnormal load escorts will also warn oncoming vehicles of approaching loads and will pull vehicles over to allow the convoy to pass. They will also pull the convoy over at predetermined locations allowing vehicles to pass reducing the risk of any large build-up of traffic;
- Appropriate traffic management measures will be put in place at the A839 Achany Wind Farm access junction to avoid conflict with general traffic, subject to the agreement of THC;
- Typical measures will include speed limit, HGV turning and crossing signs and/ or banksmen at the Proposed Development access and warning signs; and
- Provision of construction updates on the project website and a newsletter to be distributed to residents within an agreed distance of the Proposed Development.

8.6 All drivers will be required to attend an induction to include:

- A safety briefing;
- The need for appropriate care and speed control;
- A briefing on driver speed reduction agreements (to slow site traffic at sensitive locations);
- Identification of specific sensitive areas;
- Identification of the specified access route; and
- The requirement not to deviate from the specified route.

8.7 Video footage of the pre-construction phase condition of the abnormal loads access route and the construction vehicles route will be recorded to provide a baseline of the state of the road prior to any construction work commencing. This baseline will allow identification of any change in the road condition during the construction stage of the Proposed Development. Any necessary repairs will be coordinated with THC and Transport Scotland and any damage caused by traffic associated with the Proposed Development during the construction period that would be hazardous to public traffic will be repaired as soon as possible.

8.8 Damage to road infrastructure caused directly by construction traffic will be made good and street furniture that is removed on a temporary basis will be fully reinstated.

8.9 There will be a daily road edge review on the A839 in the vicinity of the Proposed Development access junction and debris and mud will be removed from the carriageway using an on-site road sweeper to keep the road clean and safe.

Operational Phase Mitigation

8.10 Site entrance roads will be well maintained and monitored.

Decommissioning Phase Mitigation

8.11 Like the construction phase, an Abnormal Load Traffic Management Plan and Construction Traffic Management Plan will be prepared for the decommissioning phase.

9 SUMMARY & CONCLUSIONS

Summary

9.1 Tetra Tech was commissioned by SSER ("the Applicant") to undertake an assessment of the transport aspects of the Proposed Development. The Site is located in Sutherland to the west of Lairg.

9.2 Existing traffic data established a base point for determining the impact during the construction phase and was factored to future levels (2025 high growth) to help determine the effect of construction traffic on the local road network at its peak.

9.3 The results indicate that total traffic movements are predicted to temporarily increase by more than 10% on 3 routes; A836 between Dornoch Firth Bridge (south side) and Bonar Bridge, A836 between Bonar Bridge and Lairg, and A949 between Clashmore and Bonar Bridge. The greatest impact of construction traffic would be experienced on the A839 between Lairg and the Proposed Development Access Junction where total movements are anticipated to increase by 37%.

9.4 The maximum traffic impact associated with construction of the Proposed Development is predicted to occur between months 7 to 8 of the 18-month programme. During these months, an average of 93 HGV movements is predicted per day and it is estimated that there would be a further 52 car and minibus / LGV movements per day to transport construction workers to and from the Proposed Development.

9.5 A worst-case cumulative assessment, calculating for Braemore Wind Farm, Lairg 2 and Creag Riabhach concluded that total traffic flows would temporarily increase on a number of routes including by 43% on the A836 and 73.92% on the A839.

9.6 It is considered highly unlikely that the construction programmes for the Proposed Development and the identified wind farms would coincide due to supply chain constraints although the significance of any cumulative effects can

be mitigated through the implementation of further measures CTMPs associated with each individual development.

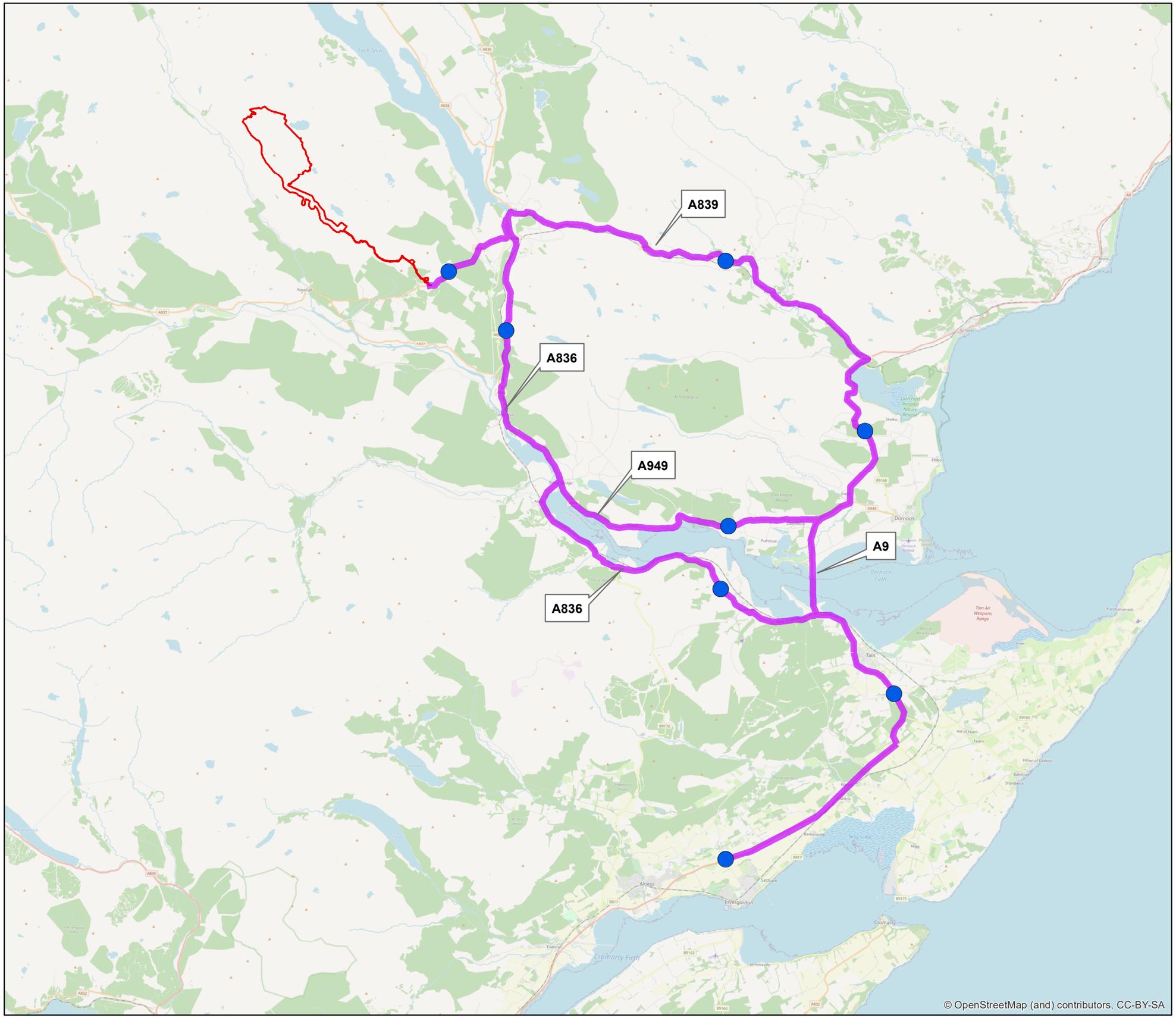
9.7 A review of the local road network was undertaken to assess the feasibility of transporting turbines to the Proposed Development. No capacity issues are expected on any of the roads assessed due to the additional construction traffic movements associated with the Proposed Development as background traffic flows are very low and the links are of reasonable standard.

Conclusions

9.8 The assessment has identified the following:

- That the construction phase of the project would generate the highest level of traffic;
- The construction traffic during the most intensive phase of the construction programme would be short lived and temporary in nature;
- That the surrounding road network has sufficient capacity to accommodate the temporary construction traffic;
- That the routes from the Ports of Entry at Nigg and Invergordon are suitable for turbine delivery; and
- That a construction traffic management plan for general construction traffic and abnormal traffic management plan are required to control construction traffic in the interests of road safety and efficiency.

FIGURES



sse Renewables

TETRA TECH

Key

- Site Boundary
- Study Area
- Traffic Count Location

Scale 1:200,000@ A3

Km

0 1

N

Figure 13.2

Study Area and Traffic Count Locations

Achany Extension Wind Farm
EIA Report

APPENDIX A

Construction Traffic Profile

Activity	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Site mobilisation/demobilisation	120	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	120
General site delivery vehicles	20	40	40	40	40	40	40	40	40	32	32	20	12	12	12	12	12	12
Earth moving plant	0	10	20	0	0	0	0	0	20	0	0	0	0	0	0	0	10	0
Imported stone	0	0	1250	1250	1250	1250	1250	1250	1250	1250	0	0	0	0	0	0	0	0
Reinforcement	0	0	0	0	14	28	28	28	14	0	0	0	0	0	0	0	0	0
Concrete	0	0	0	0	188	375	375	375	188	0	0	0	0	0	0	0	0	0
Cable Deliveries	0	0	0	0	0	2	2	2	2	2	2	0	0	0	0	0	0	0
Cabling Sand	0	0	0	0	0	188	188	188	188	188	188	0	0	0	0	0	0	0
Geotextile separators	0	0	0	0	0	4	4	4	4	4	4	0	0	0	0	0	0	0
Delivery of HV electrical items	0	0	0	0	0	11	11	11	11	11	11	0	0	0	0	0	0	0
Cranage and related vehicles	0	0	0	0	0	0	12	0	0	0	0	12	0	0	0	0	0	0
AIL Escorts	0	0	0	0	0	49	97	97	97	97	97	49	0	0	0	0	0	0
Turbine transporters	0	0	0	0	0	44	88	88	88	88	88	44	0	0	0	0	0	0
Staff	528	1056	1056	1056	1056	1056	1056	1056	1056	845	845	528	317	317	317	317	317	317
Service (food/water etc)	20	40	40	40	40	40	40	40	40	32	32	20	12	12	12	12	12	12
Total estimated movements	688	1266	2406	2386	2588	3087	3191	3179	2998	2549	1299	673	341	341	341	341	471	461
Working Days	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Daily Average	31	58	109	108	118	140	145	145	136	116	59	31	16	16	16	16	21	21
Lights	24	48	48	48	48	50	52	52	52	43	43	26	14	14	14	14	14	14
HGVs	7	10	61	60	70	90	93	92	84	73	16	4	1	1	1	1	7	7