CHAPTER 12: TRAFFIC AND TRANSPORT

Figures

Appendices

12. TRAFFIC AND TRANSPORT

12.1 Executive Summary

12.1.1 This Chapter assesses the main traffic and transport effects associated with the Proposed Varied Development. The assessment is focussed on the construction phase, during which the majority of traffic would be generated.

12.1.2 The assessment has been carried out by WYG Environment Planning Transport Limited, part of the WYG Group in accordance with the Institute of Environmental Assessment (now Institute of Environmental Management and Assessment (IEMA – and referred to as such below) 'Guidelines for the Environmental Assessment of Road Traffic (1993), complemented by professional judgement and the experience of the assessors. The IEMA Guidelines were used as a screening process to define the geographical boundaries of the assessment. The assessment includes a review of the roads hierarchy, a review of traffic count data, and a visit undertaken on Friday 31st August 2018 to visually assess the general nature and condition of the routes around the site.

12.1.3 The potential effects of the development traffic were drawn from the IEMA Guidelines including severance, driver delay, pedestrian delay, pedestrian amenity, fear and intimidation, and accidents and safety. Other sources such as the DMRB have also been consulted.

12.1.4 As per the Consented Development, the Proposed Varied Development proposes the same mitigation measures namely: a significant amount of material will be sourced from borrow pits on site and concrete will be batched on site, which will significantly reduce transport requirements; and traffic management measures and communications protocols to reduce adverse effects of the construction traffic.

12.1.5 The Consented Development proposed 15 turbines with 51.5m blades. The Proposed Varied Development is for 11 turbines with maximum blade dimension of 66.7m, with appropriate alterations to access tracks to accommodate the reduced number of turbines. Although their transportation will require some further modifications to the road network along the route, the actual traffic impact will be reduced given the reduction in trips resulting from the reduced number of turbines involved in construction and operation of the Proposed Varied Development.

12.1.6 Based on existing traffic data and the estimated construction vehicle movements, the assessment concludes that no significant long-term detrimental effects are predicted as a result of construction traffic associated with the Proposed Varied Development. A cumulative assessment has also been undertaken which concludes that no significant cumulative effects are predicted on the local roads network.

12.2 Introduction

12.2.1 The purpose of this Chapter is to provide information about the proposed transport arrangements associated with the construction, operational and decommissioning phases of the Proposed Varied Development.

12.2.2 The main traffic and transport effects relating to the Proposed Varied Development would be associated with the traffic movements during the construction period, when vehicles would access the site transporting construction staff, construction materials (aggregates, cement, steel bar etc.), plant items and turbine components.

12.2.3 Once operational, it is envisaged that the amount of traffic associated with the Proposed Varied Development would be minimal, although regular visits would be made for maintenance operations.

12.2.4 The decommissioning phase would involve fewer trips on the public road network than the construction phase, as elements of infrastructure such as access tracks and electrical connections are often left in place (in agreement with The Local Planning Authority and the landowner), adding to local infrastructure.

12.2.5 This Chapter is supported by Appendix 12.1: Route Survey Report.

12.3 Consented Development

Summary of Effects

12.3.1 The 2015 ES highlighted that a significant amount of material will be sourced from borrow pits on site and concrete will be batched on site, which will significantly reduce transport requirements. A number of mitigation measures were also proposed in the 2015 ES to reduce the adverse effects of the construction traffic, including traffic management measures and communications protocols.

12.3.2 Based on existing traffic data and the estimated construction vehicle movements, the 2015 ES concluded that no significant detrimental effects are predicted as a result of construction traffic associated with the proposed development. A cumulative assessment was also undertaken which concluded that no significant cumulative effects are predicted on the local roads network.

12.3.3 The 2016 FEI Report considered changes made to the project, concluding that revisions to the layout for the Consented Development would result in a very slight reduction in construction traffic numbers for the project as a whole, which would not alter the assessment of effects predicted in the 2015 ES.

Consultation Responses

12.3.4 In their response to the 2015 ES, Transport Scotland noted that they had no objection to the Consented Development in terms of environmental impacts on the trunk road network, subject to the inclusion of Conditions of Consent covering abnormal loads and general transportation of materials and components. Similarly, The Highland Council as roads authority were satisfied with the principle of the Consented Development, subject to Conditions being attached covering traffic management, widening details and wear and tear agreements.

Relevant Conditions

12.3.5 The following Conditions of the existing consent are relevant for transport.

<u>Condition 17: Traffic Management</u>

There shall be no Commencement of the Development until a finalised Traffic Management Plan, founded upon a detailed assessment of relevant roads, of the expected use of the local road network by all general construction traffic and abnormal load movements, with an appropriate package of mitigation I improvement works is agreed by the Planning Authority in consultation with the Local Roads Authority. This will include:

(i) The provision of a wear and tear agreement including the posting of a financial bond for all delivery periods during construction, significant repairs and decommissioning. The agreement shall require joint (Company and Highland Council) before and after road condition surveys and regular monitoring of traffic levels and road conditions during the construction phase of the development.

(ii) A risk assessment for transportation during daylight hours and hours of darkness.

(iii) Traffic management and mitigation measures on the access route for example measures such as temporary speed limits, suitable temporary signage, road markings and the use of speed activated signs.

(iv) A procedure for the regular monitoring of road conditions and the implementation of any remedial works required during the construction period.

(v) A detailed delivery programme for abnormal load movements, which shall be made available to Highland Council and, as required, community representatives. This should be informed by a structural assessment of bridges, culverts and any other affected structures along the route shall be undertaken in consultation with the Council's Chief Structural Engineer.

(vi) A detailed protocol for the delivery of abnormal loads/vehicles, prepared in consultation and agreement with interested parties, including Highland Council, the Police, Transport Scotland and, as required, community representatives. The protocol shall identify any requirement for convoy working and/or escorting of vehicles and include arrangements to provide advance notice of abnormal load movements in the local media. A contingency plan prepared by the abnormal load haulier. The plan shall be adopted only after consultation and agreement with the Police and the respective roads authorities. It shall include measures to deal with any haulage incidents that may result in public roads becoming temporarily closed or restricted.

(vii) Measures to ensure that all affected public roads are kept free of mud and debris arising from the development.

The approved Traffic Management plan and requirements of the Trunk Road Authority shall thereafter be implemented in full, unless otherwise agreed in advance and in writing with the Planning Authority.

Reason: In the interests of road safety and to ensure that abnormal loads access the site in a safe manner.

12.3.6 No changes are proposed to this Condition of Consent.

Condition 18: Abnormal Loads (Signage on Trunk Road Network)

During the delivery period of the wind turbine construction materials any additional signing or temporary traffic control measures deemed necessary on the Trunk Road Network due to the size or length of any loads being delivered or removed must be undertaken by a recognised QA traffic management consultant, to be approved by Transport Scotland before delivery commences.

Reason: In the interests of road safety and to ensure that abnormal loads access the site in a safe manner.

12.3.7 No changes are proposed to this Condition of Consent.

Condition 19: Abnormal Loads (Signage on Council maintained Roads)

Temporary signage, in the form of demountable signs or similar approved, shall be established, when required, to alert road users and local residents of expected abnormal load movements. All such movements on Council maintained roads shall take place outwith peak times on the network, including school travel times, and shall avoid local community events.

Reason: In the interests of road safety and to ensure that abnormal loads access the site in a safe manner.

12.3.8 No changes are proposed to this Condition of Consent.

12.4 Scope of Assessment

Study Area

12.4.1 The study area is the same as that assessed within the transport assessment of the 2015 ES, given that the proposals are for a reduced number of turbines, from 16 (as assessed in 2015 ES)

to 11, using the same delivery route. Following site survey in August 2018, no notable changes to the proposed delivery route were identified, compared to that assessed in the 2015 ES.

12.4.2 The Consented Development comprised components with 51.5m blades; the current proposals are for blades of up to 66.7m. The increase in length of blade will not result in additional traffic movements as the blades are transported in a single pre-constructed section. The reduction in number of wind turbines consequently reduces the number of traffic movements for the wind turbine components.

12.4.3 Although the towers will be increased in height to accommodate the longer blades, it will not result in more trips. As the proposed number of turbines is reduced from 16 to 11, the Proposed Varied Development would result in a reduction in abnormal load movements when compared to the Consented Development.

12.4.4 The study area comprises of sections of the public road network that would be used by construction and operational traffic accessing the site. The likely route to the Proposed Varied Development that would be used by abnormal loads and construction traffic are set out below:

- A9 Trunk Road;
- Clynelish Distillery Road; and
- C6 Strath Brora Road.

12.4.5 This is the same delivery route used for the operational Gordonbush Wind Farm. The route was upgraded as part of the Gordonbush Wind Farm construction, and substantial works were undertaken on the public road network to accommodate the associated abnormal loads, such as:

- Widening the junction of the A9 / Clynelish Distillery at Old School House;
- Localised strengthening, reinforcement and widening of the Clynelish and Moss roads;
- Straightening the approach to Gordonbush Bridge;
- Widening the approach to Oldtown Bridge; and
- Constructing a high standard track from Ascoile leading to the wind farm site, sufficient for the delivery of turbine components and materials.

12.4.6 The component parts for these larger turbines (66.7m as opposed to 51.2m blades) will require additional modifications to the road network. These modifications are detailed in the Route Survey Report (Appendix 12.1).

Consultation

12.4.7 Pre-application engagement has occurred with The Highland Council and Transport Scotland, responses from which are included in Table 12.1. It should also be noted that given the reduction in traffic movements, it has been assumed that the responses received in relation to the Consented Development remain relevant.

Table 12.1: Consultation Summary

Consultee	Summary Response	Comment/Action Taken
The Highland Council – Transport Planning	The access is the same as for the existing windfarm and the permitted extension. Revised swept paths will be required to be submitted with any application for the larger turbines.	A swept path assessment is included in Appendix 12.1.
The Highland Council – Transport Planning	The EIA shall include a Transport Assessment. This shall be a stand-alone chapter and shall consider in detail the impact of development traffic on the Council maintained roads affected. It shall consider and propose measures necessary to mitigate the impact of the development. These measures	An assessment of impact on transport is included in this chapter and supporting

Consultee	Summary Response	Comment/Action Taken
	may include; new or improved infrastructure, road safety measures and traffic management. The attached guidance document provides further information on the required content. It is acknowledged that a reduced scope may be applicable due to the extant permissions. The applicant should contact the Transport Planning Team and Transport Scotland to agree the detailed contents of the TA.	appendices. The implementation of any mitigation measures will be controlled through Condition 17, which is to be retained.
The Highland Council – Transport Planning	The port of entry shall be identified for the abnormal loads (it was previously Invergordon). Routes for goods vehicles as well as the abnormal loads shall be confirmed and where additional traffic or larger loads are proposed then the suitability of the routes for the additional traffic shall be assessed. It appears that the original TA did not include ready mix concrete or import of stone for the access routes any assumptions regarding on site quarries or batching should be stated. The volume of construction traffic for the revised proposals should be submitted and any assumptions should be confirmed or a conservative approach taken.	There are two potential ports of entry assessed within the Swept Path Assessment (see Appendix 12.1). The borrow pit report (Appendix 9.1) confirms that there is sufficient rock within the borrow pits identified on site to satisfy the demands of construction. Concrete would be batched on site.
The Highland Council – Transport Planning	A new assessment of the suitability of the routes will be required as these proposals are for larger turbines. Therefore an assessment of the capacity of any existing bridges and other structures along the construction routes may be required. A swept path analysis of the route will be required.	A swept path assessment is included in Appendix 12.1.
The Highland Council – Transport Planning	Where these works (road improvements) are outside the current road boundary then the red line boundary of the application will need to cover these items or separate planning permission will be required. The scope of any mitigation works and control of the land required for them should therefore be demonstrated at the planning application stage. All works on the Council maintained public road will require the approval of the Council as Roads Authority through a Road Construction Consent together with any necessary Technical Approval for works on structures. Therefore detailed and dimensioned plans showing any mitigation proposals on and adjacent to the public road will be required to be agreed prior to any works commencing on site.	Comments noted.
The Highland Council – Transport Planning	The TA should include a framework CTMP aimed at minimising the impact of the construction traffic. It shall include measures to ensure development traffic adheres to the approved routes and to prevent platooning during heavier flows such as any ready mix concrete pours. Consultation with the local community and the Local Area Roads Office will be required for the detailed content and implementation of the CTMP.	Condition 17 requires the production of a Traffic Management Plan prior to the Commencement of Development. The Proposed Varied Development seeks no alteration to condition 17.
The Highland Council – Transport	In order to protect the interests of the Council, as roads authority, a suitable agreement relating to Section 96 of the Roads (Scotland) Act and appropriate planning legislation - including the provision of an appropriate Road Bond or	Condition 17 requires the production of a Traffic Management Plan, including the

Consultee	Summary Response	Comment/Action Taken
Planning	similar security (known as a Wear and Tear Agreement) may be required. Construction should not run concurrently with other projects generating a significant increase in HGV traffic, alternatively a joint CTMP and Wear and Tear Agreement for the schemes to run concurrently would be required.	provision of a bond or similar. The Proposed Varied Development seeks no alteration to Condition 17.
Transport Scotland	Transport Scotland is in agreement with this approach, with the provision that an Abnormal Indivisible Load Assessment be provided to confirm that the proposed route is capable of accommodating the increased size in turbine components. The details required will include a swept path analysis and identification of potential mitigation measures including the temporary removal of street furniture, any proposed junction widening, traffic management etc. to ensure that transportation will not have any detrimental effect on structures within the trunk road route path.	An Abnormal Indivisible Loads Assessment is provided in Appendix 12.1. Mitigation work is identified therein.

Scope Out of Assessment

12.4.8 As is normal practice with this type of study, the assessment excludes operational and decommissioning effects. The traffic generated once the Proposed Varied Development is operational would be associated mainly with service and maintenance trips and so their impact is likely to be negligible. Vehicle types would mainly be 4x4s along with the potential for occasional Heavy Goods Vehicle (HGV) movements accessing the site for heavier maintenance and repairs. These trips are unlikely to have any noticeable impact on the operation of the road network.

12.4.9 As per the Consented Development, the expected operational life of the Proposed Varied Development is 25 years from the date of commissioning. At the end of this period, a decision would be made as to whether to refurbish, remove, or replace the turbines. Relevant consents / permits would be sought, and additional assessments undertaken as required. However, the baseline data used for the purposes of this assessment may not be relevant so far in the future and so a quantitative assessment of traffic effects during decommissioning cannot be undertaken at this point in time. Due to the uncertainties associated with estimating traffic movements so far in the future, and the likely effects associated with the decommissioning phase (i.e. less than those estimated in the assessment of the effect of the construction traffic), the effects of decommissioning have not been considered in this assessment.

12.5 Legislation, Policy and Guidance

12.5.1 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 energy proposals. It is worth noting that there have been no changes in transport policy between the Consented Development and the Proposed Varied Development.

National Policy

National Legislation and Policy

12.5.2 'Scotland's Transport Future', published by the Scottish Government (formerly the Scottish Executive) in June 2004, outlines the Scottish Government's vision for transport at national and regional levels across Scotland and states that its overall aim is "to promote economic growth, social inclusion, health and protection of our environment through a safe, integrated, effective and efficient transport system." The publication observes that "the vast bulk of freight traffic will continue to be carried by road".

12.5.3 Scottish Planning Policy (SPP), 2014 is a statement of Scottish Government policy on land use planning. SPP states that a Transport Assessment should be carried out where a new development is likely to result in a significant increase in the number of trips as well as identifying potential cumulative effects of development. Providing for the safe and efficient movement of traffic on the strategic road network requires the implications of development proposals on traffic and road safety to be taken into account. SPP refers specifically to wind farm developments, with reference made to the potential constraint of site access. SPP also refers to the haulage of minerals. It states that *"where there are significant transport effects on local communities, routes which avoid settlements as far as possible should be identified."* In the context of this study, as it results in no long lasting traffic related effects, there is no requirement for undertaking a Transport Assessment.

Regional Policy

12.5.4 The Highlands and Islands Transport Partnership (HITRANS) Regional Transport Strategy (RTS), published in 2008 and currently under revision, states how *"continued investment in the region's infrastructure and services will allow the region to make a full and effective contribution to national economic life."* This continued investment is expected to *"support the development of key and emerging sectors"* such as renewable energy. The RTS also confirms that road transport is the dominant mode for freight transport in the region. However, it also acknowledges that existing road traffic flows are such that present levels of HGV volumes on the region's roads do not have significant negative environmental effects.

Transport Assessment Guidance (2012)

12.5.5 Transport Scotland's Transport Assessment Guidance was published in 2012. It aims to assist in the preparation of Transport Assessments 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.

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

Local Policy

12.5.7 THC's current Local Transport Strategy (LTS), 2014 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 also 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, as well as providing for industries that are heavily dependent on large vehicle transport.

12.6 Methodology

Desk Study

12.6.1 The traffic and transport chapter of the ES 2015 included a baseline review which focused on the nature of the surrounding road infrastructure and the level of traffic that uses it. That review is deemed to still be relevant to this assessment for the Proposed Varied Development.

It was informed by desktop studies and consultation (see Appendix 12.1), comprising the following:

- Review of responses to the Gordonbush Extension Scoping Report (September 2013);
- Review of responses to additional consultation undertaken by CH2M specifically on traffic issues;
- Collection of traffic flow data;
- Review of any roads hierarchy promoted in relevant Local Transport Strategies;
- Identification of sensitive junction locations;
- Identification of constraints to the roads network, with or without height / width / weight restrictions;
- Identification of areas of road safety concerns;
- Identification of other traffic sensitive receptors in the area (routes, communities, buildings etc.); and
- Review of Ordnance Survey (OS) plans to derive a local area roads network.

Field Surveys

12.6.2 A site visit has been undertaken to further review the road network in the study area for the Proposed Varied Development, and to identify potential constraints on the network. This included:

- Visual inspection of all roads identified in the study area network (on 31st August 2018); and
- Photographic/video record of all constraints.

Method of Assessment

12.6.3 The following rules taken from the IEMA Guidelines, are used to determine which links within the study area should be considered for detailed assessment:

- Rule 1 – include highway links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%); and
- Rule 2 – include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

12.6.4 The IEMA Guidelines identify the key impacts that are most important when assessing the magnitude of traffic impacts from an individual development as follows:

- Severance – the IEMA Guidance states that, “severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery.” Further, “Changes in traffic of 30%, 60% and 90% are regarded as producing ‘slight’, ‘moderate’ and ‘substantial’ [or minor, moderate and major] changes in severance respectively”. However, the Guidelines acknowledge that “the measurement and prediction of severance is extremely difficult”;
- Driver delay – the IEMA Guidelines note that these delays are only likely to be ‘significant [or major] when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.”;
- Pedestrian delay – the delay to pedestrians, as with driver delay, is likely only to be major when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. An increase in total traffic of approximately 30% can double the delay experienced by pedestrians attempting to cross the road and would be considered ‘major’;

- Pedestrian amenity – the IEMA Guidelines suggests that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its HGV component) is halved or doubled. It is therefore considered that a change in the traffic flow of -50% or +100% would produce a 'major' change in pedestrian amenity;
- Fear and intimidation – there are no commonly agreed thresholds for estimating levels of fear and intimidation, from known traffic and physical conditions. However, as the impact is considered to be sensitive to traffic flow, changes in traffic flow of 30%, 60% and 90% are regarded as producing 'minor', 'moderate' and 'major' changes in severance respectively; and
- Accidents and safety – professional judgement would be used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents.

Assessment of Effects

12.6.5 Having identified the environmental effects to be considered and the road network to be included within the analysis, the next stage of the assessment is to quantify the magnitude of the environmental effects and to identify the level of significance that such a change may have, taking into account an evaluation of the sensitivity and value of the receptors.

Sensitivity/Importance

12.6.6 The receptors that may be affected by the traffic effects arising from the construction of the Proposed Varied Development are likely to be settlements along the turbine delivery route and the construction traffic route(s). These settlements are classified by size, function, presence of school and community facilities, traffic calming or traffic management measures, vehicle speed limits and position on the roads hierarchy, using the criteria identified in Table 12.2. This classification is based upon subjective judgement and relative sensitivity to the potential traffic effects of the Proposed Varied Development.

Table 12.2: Classification of Receptor Sensitivity

Sensitivity	Comment/Action Taken
High	Typically, receptors with high importance and rarity on an international and national scale and with limited potential for substitution. To include large rural settlements containing a high number of community and public services and facilities, areas with traffic control signals, waiting and loading restrictions, traffic calming measures and minor rural roads, not constructed to accommodate frequent use by HGV.
Medium	Typically, receptors with high or medium importance and rarity on a regional scale and with limited potential for substitution. To include intermediate sized rural settlements containing some community or public facilities and services, areas with some traffic calming or traffic management measures and local A or B class roads, capable of regular use by HGV traffic.
Low	Typically, receptors with low or medium importance and rarity on a local scale (on-site or neighbouring the site). To include small rural settlements with few community or public facilities or services, areas with little or no traffic calming or traffic management measures and trunk or A-class roads, constructed to accommodate significant HGV composition.
Negligible	Typically, receptors with little importance and rarity. To include roads with no adjacent settlements including new strategic trunk roads or motorways that would be little effected by additional traffic and suitable for abnormal loads.

Magnitude of Effects

12.6.7 The effect of increased traffic volumes has been initially based on the Rule 1 and Rule 2 criteria introduced previously. As referenced in the IEMA Guidelines, a range of indicators for determining the significance of the relief from severance advises that changes in traffic flow of

30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively. Additionally, it is generally accepted that traffic flow increases of less than 10% on uncongested roads are generally considered to be 'not significant', given that daily variations in background traffic flow may vary by this amount. Based on these rules and perceptions, the magnitude of the effects is classified using the criteria identified in Table 12.3.

Table 12.3: Effects Magnitude

High	Medium	Low	Negligible
>90% increase in traffic	60% - 90% increase in traffic	30% - 60% increase in traffic	0% - 30% increase in traffic

Significance of Effect

12.6.8 To determine the overall significance of the impacts, the results from the receptor sensitivity and effects magnitude assessment are correlated and classified using a scale set out in Table 2.4 of Volume 11, Section 2, Part 5 of the DMRB and summarised in Table 12.4.

Table 12.4: Classification of Receptor Sensitivity

Consultee	Major	Moderate	Minor	Negligible
High	Large	Large / Moderate	Moderate / Slight	Slight
Medium	Large / Moderate	Moderate	Slight	Slight / Neutral
Low	Moderate / Slight	Slight	Slight	Slight / Neutral
Negligible	Slight	Slight	Slight / Neutral	Neutral

12.6.9 For the purposes of assessing significant effects under the IEMA Regulations, this matrix provides a guide subject to professional judgement. For example, the introduction of a low number of additional HGV movements on a route that does not currently have a large number of HGV trips are recorded as being highly statistically significant, even though the numbers of additional trips could be as low as up to five to ten additional vehicles. Despite the fact that additional traffic may be low in real terms, it may be statistically high i.e. may constitute a high degree of change in relation to current traffic volumes. However, it is not necessarily a significant effect. Effects are considered to be significant where the effect is classified as being of equal to or greater than moderate significance.

Limitations of the Assessment

12.6.10 The main limitation of this assessment is that, in line with standard procurement practice, a contractor and supply-chain for materials would not be selected prior to the Proposed Varied Development receiving consent. Consequently, the information presented in this Chapter is necessarily indicative.

12.6.11 The proposed route for the wind farm components is based on the previous development of the Gordonbush Wind Farm and so it is reasonable to assume it is still the most appropriate route for this purpose. The likely vehicle types, size and configuration are based on the Applicant's experience of construction and operation of wind farms in Scotland.

12.6.12 Until contractors have been appointed and materials sources have been identified, it is not possible to determine exactly how many vehicles would reach the site using the recommended routes. Hence, the assessment has assumed that 100% of the remaining construction traffic i.e. that not associated with the transport of the wind farm components, would use the A9 north and south. This clearly presents a worst-case scenario and so the results of the traffic impact will be overstated.

12.7 Baseline Conditions

Context

12.7.1 The context of the Proposed Varied Development remains the same as that for the Consented Development which is located north-west of Brora, a village situated in the east of Sutherland in the Highlands (see Figure 1.1: Site Location). The main A-class road on the surrounding network is the A9 Trunk Road. The A9 links the south of Scotland with the far north and, from Inverness, runs across the Moray Firth, through the Black Isle, across the Cromarty Firth, near Invergordon and Tain, across the Dornoch Firth and Loch Fleet, near Golspie and beyond via Brora ending at Thurso. From the A9 close to Brora there is a network of local roads linking communities and settlements to the west. Access to the Proposed Varied Development is from one of these local roads, the C6 Strath Brora Road.

12.7.2 Sections of the local road network were upgraded as part of the operational Gordonbush Wind Farm construction to accommodate associated construction and abnormal loads traffic.

Desk Study

Review of Roads Hierarchy

12.7.3 The HITRANS Regional Transport Strategy summarises the region's agreed transport network hierarchy into the categories strategic, regional and locally significant, in order of decreasing importance. The A9 is designated as part of the strategic road network while the Clynelish Distillery Road and the C6 Strath Brora Road are not designated as being significant. In addition, the THC LTS sets out a roads hierarchy which designates the A9 as Trunk Road (strategic) and, again, the Clynelish Distillery Road and the C6 Strath Brora Road have no designation in its roads hierarchy.

Review of Traffic Count Data

12.7.4 The traffic and transport chapter of the 2015 ES included a data collection exercise, reproduced here for consistency. A desktop review of traffic count data was undertaken. The data consisted of 2013 Automatic Traffic Counts (ATC) obtained from Transport Scotland, which were supplemented with targeted ATC counts in November 2014 (as agreed with THC). The review focussed on weekday 2-way Annual Average Daily Flow (AADF) and the weekday average daily flow (ADF) from the supplementary counts (undertaken over 2 weeks in November 2014) and, where available, the average weekday percentage of HGVs. The data have been summarised in Table 12.5.

Table 12.5: 2014 Traffic Count

Site Ref.	Transport Scotland Site Ref.	Location Description	Weekday AADF	Weekday %HGV	Weekday AM Peak (2013 Annual Average)	Weekday PM Peak (2013 Annual Average)
1	104890	A9 Berriedale	1837	15%	161	166
2	ATC01026	A9 Brora to Helmsdale	2613	-	225	231
3	ATC01025	A9 Golspie to Brora	3878	-	324	345
4	ATC01334	A9 Poles to The Mound (B9174 to A839)	4562	-	360	408
5	ATC01023	A9 Dornoch Bypass (A949 to B9168)	4045	-	310	357
6	JTC08225	A9 Dornoch	6260	12%	492	564
7	ATC01020	A9 Dornoch Bridge	6347	-	485	574

Site Ref.	Transport Scotland Site Ref.	Location Description	Weekday AADF	Weekday %HGV	Weekday AM Peak (2013 Annual Average)	Weekday PM Peak (2013 Annual Average)
8	ATC01021	A9 Tain North (B9174) to Dornoch Bridge	7471	-	567	668
9	ATCNW007	A9 Garrick Bridge to Logie Easter	7089	-	507	663
10	ATC01333	A9 Kildary (B817) to Nigg Junction (B9165)	9370	-	697	852
11	ATC01018	A9 Tomich Junction to Kildary (B817)	8672	-	645	776
12	ATC01017	A9 Obsdale Junction to Tomich Junction	11065	-	845	996
13	-	Clynelish Distillery Road	289	6%		
14	-	C6 Strath Brora Road	84	5%		

12.7.5 The traffic data illustrates that the two-way weekday AADF are modest with a maximum of approximately 10,000 – 11,000 vehicles on the A9 near Invergordon. Flows generally decrease on the A9 as it continues north, with weekday AADF flows of approximately 4,000 at Brora. The 2013 data, obtained from Transport Scotland, indicates an HGV percentage of 12% – 15% on the A9, while the HGV percentages on the Clynelish Distillery Road and the C6 Strath Brora Road, surveyed in November 2014, were recorded as approximately 6%.

Field Studies

Vehicle Routes

12.7.6 WYG undertook a site visit on Friday 31st August 2018 to visually assess the potential routes to the site to inform this Chapter and the Abnormal Loads Assessment (see Appendix 12.1). It has been determined that all construction vehicles will originate from the A9, north and south of Brora and travel between Brora and the site entrance via Clynelish Distillery Road and the C6 Strath Brora Road. The trunk road network in the vicinity of the Proposed Varied Development site has reasonably good horizontal and vertical alignment suitable for accommodating general HGV construction traffic. As mentioned previously, there are two POE identified for the delivery of wind farm components, Invergordon or Nigg.

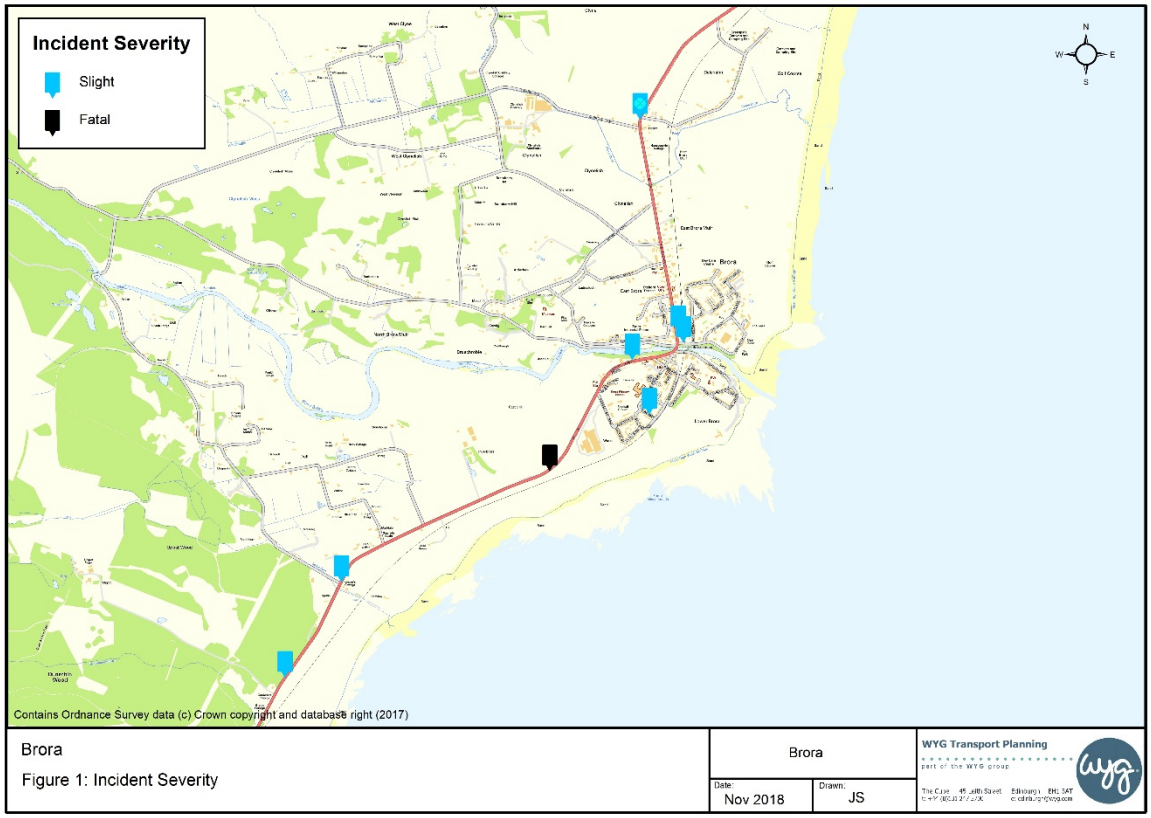
Abnormal Load Routes

12.7.7 The Proposed Varied Development is an extension to an existing site (albeit with larger component parts) and assumes that the proposed POE for abnormal loads is Invergordon or Nigg and that, the proposed route for abnormal loads is to travel northbound on the A9 via Evelix, Golspie; and Brora, before continuing westbound on the Clynelish Distillery Road and the C6 Strath Brora Road to the Proposed Varied Development site access (the same access used for the operational Gordonbush Wind Farm).

Accidents

12.7.8 The online source http://www.crashmap.co.uk/ was used to rereview the accident data on the A9 in Brora. For the 5-year period 2013 to 2017 there were a total of 7 accidents recorded, 6 slight and one fatal. One slight accident was recorded in close proximity to the A9 / Clynelish Distillery Road junction.

12.7.9 Figure 12.1 below illustrates the location of personal injury accidents for the 5 year period 2013-2017.



12.8 Potential Effects

12.8.1 The IEA 1993 guidelines recommend that the following environmental effects are considered to be potentially important when assessing the traffic effects from an individual development. Many of these effects are considered elsewhere within the EIA Report due to the specialist skills required in assessing these. The effects highlighted in bold, are considered in this Chapter:

- Noise (Chapter 13 of this EIA Report);
- **Severance** – in this context, the perceived division occurring within a community, i.e. the difficulty of crossing the road, which may result from the temporary increase in traffic during the construction period;
- **Driver Delay** – traffic delays to non-development traffic can occur at several points on the network surrounding the site including at the site entrance, on the highways passing the site, at other key intersections and at side roads (where the ability to find gaps in the traffic may be reduced, thereby lengthening delays);
- **Pedestrian Delay** – changes in the volume, composition or speed of traffic may affect the ability of people to cross roads and, in general, increasing traffic levels are likely to lead to greater increases in delay depending upon the general level of pedestrian activity, visibility and general physical conditions of the site;
- **Pedestrian Amenity** – broadly defined as the relative experience of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width/ separation from traffic;
- **Fear and Intimidation** – this is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths;
- **Accidents and Safety** – the determination of effects which may elevate or lessen the risks of accidents, e.g., junction conflicts;

- **Hazardous Loads** – not considered as no hazardous loads expected during construction i.e. nuclear waste or similar;
- Air Pollution (Appendix 4.1: Draft CEMP); and
- Dust and Dirt (Appendix 4.1: Draft CEMP).

12.9 Mitigation Measures

12.9.1 Mitigation measures relating to the transportation of turbines and materials to site are secured through Condition of Consent 17, requiring the production of a Traffic Management Plan.

Mitigation During Construction

Route Selection

12.9.2 The primary mitigation measure to help minimise the effects of the construction traffic is the careful consideration of the roads network to identify a preferred route to and from the Proposed Varied Development access junction. This has considered physical characteristics of the roads network and the number and location of potentially sensitive receptors along the various routes.

General Modifications Required for Turbine Components

12.9.3 A Route Survey Report (see Appendix 12.1) has identified the required modifications required for the transport of the turbine equipment. The larger turbine blade loads will require additional mitigation measures at various locations. In addition, additional temporary street furniture modifications will be required at certain points on the A9 trunk road.

On Site Sourcing of Material

12.9.4 It is intended that a significant amount of material for the construction of access tracks and areas of hardstanding (at turbine bases and site compounds) will be sourced on site from borrow pits. This significantly reduces potential effects on the road network by reducing the material import requirements and hence the vehicle movements.

Concrete Batching

12.9.5 It is anticipated that concrete would be batched on-site to help minimise the effect on the surrounding road network.

Road Maintenance

12.9.6 As stated in the consultation response from THC, it will be necessary to establish the current condition of the roads, including road surface condition and profile prior to commencing construction of the Proposed Varied Development to establish a baseline for any subsequent repairs required during the construction period. A regime to establish a wear and tear repair process will be agreed with THC post consent.

Traffic Management Measures

12.9.7 In addition to the specification of preferred access routes and the detailed phasing of construction traffic, additional measures and initiatives would be introduced to minimise the intrusive effects of construction related traffic.

12.9.8 During the construction period, a community liaison group would be set up to disseminate information and take feedback and the project website would be regularly updated to provide the latest information relating to traffic movements associated with vehicles accessing the site. This would be agreed with THC as the Local Roads Authority.

12.9.9 Conflict between construction traffic and other road users would be managed through the implementation of Traffic Management proposals managed through a Traffic Management Plan (TMP) as set out in Condition 17.

12.9.10 The following measures would be implemented during the construction phase:

- Avoiding abnormal load transit through communities at peak times, including school arrival and departure times;
- An abnormal load communications protocol to avoid delays with emergency vehicle traffic;
- Communication of proposed delivery movements to liaise with the communities to avoid key dates such as fetes etc.
- All materials delivery lorries (dry materials) would be sheeted to reduce dust and stop spillage on public roads;
- Specific training and disciplinary measures would be established to ensure the highest standards are maintained to prevent construction vehicles from carrying mud and debris onto the carriageway;
- Wheel wash facilities would be established at the site entrance;
- Working hours would be limited to between 0700 and 1900 Monday to Friday and Saturdays between 0700-1400 between April and September (0730-1400 in winter). AIL component deliveries may take place outside these hours. In the event of work being required outwith these hours, the Planning Authority will be notified prior to these works taking place, wherever possible;
- Appropriate traffic management measures would be put in place on the A9 in Brora, subject to the agreement of the roads authority. Typical measures would include speed limit and HGV turning and crossing signs;
- Provision of construction updates on the project website and a newsletter to be distributed to residents within an agreed distance of the site;
- Adoption of a voluntary speed limit of 30 mph for all construction vehicles on the local road network; and
- All drivers would 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 route; and
- The requirement not to deviate from the specified route.

12.9.11 Video footage of the pre-construction phase of the abnormal loads access route and the construction vehicles route would be recorded to provide a baseline of the condition of the road prior to any construction work commencing. This baseline would allow identification of any change in the road condition during the construction stage of the proposed development. Any necessary repairs would be coordinated with the Roads Authority. Any damage caused by traffic associated with the proposed development during the construction period, that would be hazardous to public traffic, would be repaired immediately.

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

12.9.13 There would be a daily road edge review and any debris and mud removed from the carriageway using an on-site road sweeper to keep the road clean and safe.

12.9.14 THC has indicated that as there may be a risk of damage to local roads from construction traffic, a suitable agreement relating to Section 96 of the Roads (Scotland) Act and appropriate planning legislation - including the provision of an appropriate Road Bond or similar security

(known as a Wear and Tear Agreement) may be required. The detail would be finalised in the TMP required to discharge Condition 17.

Monitoring

12.9.15 The transportation effects of the construction traffic are temporary only. Mud and debris on the surrounding road network in the vicinity of the Proposed Varied Development site would be monitored by the Applicant and inspections of the mitigation work would be undertaken on a regular basis by the Applicant and Roads Authority to confirm these measures are proving effective at reducing effects. Where necessary, mitigation measures would be reviewed and amended.

12.10 Residual Effects

Introduction

12.10.1 This section considers the level of sensitivity to the increase in vehicle movements associated with the construction phase.

Derivation of Development Traffic

12.10.2 It is anticipated that construction of the Proposed Varied Development will take approximately 13 months. The construction programme and predicted traffic movements forming the basis of the effect assessment provided to WYG are summarised in Table 12.6 and Table 12.7 respectively. In predicting the traffic movements, the following assumptions have been made:

- The Proposed Varied Development will consist of 11 turbines;
- No commercial forestry felling is required on-site;
- Concrete batching anticipated on-site;
- Stone for the construction of access tracks and hardstandings is assumed to be sourced from on-site borrow pits, however an allowance has been made for importing the capping stone for the access tracks and crane hardstandings from offsite quarries (although considered likely, without intrusive GI in the borrow pit extension areas to indicate if suitable rock for capping is available, it is deemed prudent to include these journeys should no suitable capping material be sourced on site);
- Due to the nature of materials and plant required on site, the majority of delivery vehicles utilised would be HGV;
- Deliveries of plant for Civil and Electrical works on site (based on recent project experience);
- The concrete pump is not permanently on site but is brought in for each wind turbine base pour individually and any other pours as required;
- Turbine delivery movements are based on the delivery of: three blades per turbine (one vehicle per blade); three tower components per turbine (base, mid and top); one nacelle per turbine; one blade hub per turbine; one can per turbine; and 5 storage cabins allowed for use by wind turbine supplier;
- Two civilian escort vehicles (LGV) have been assumed per abnormal load convoy of three loads for the wind turbine components and main erection crane. Police escorts will also be present, likely in the form of motorcycles;
- Sand and aggregates for concrete production are to be imported using 20T capacity HGVs ;
- Cement for concrete is to be imported using a $32m^3$ capacity HGV – an additional number of journeys has been added to this figure as per the sand and aggregates;
- Reinforcement for concrete is to be delivered on 20T capacity HGVs (85T of reinforcement per base plus an allowance for additional reinforcement requirements has been allowed);

- Assumed that piles are delivered on a 20T capacity HGV with 14 piles delivered per vehicle;
- Geotextiles are delivered on a 20T capacity HGV – vehicle numbers based on delivery of 80 rolls per vehicle;
- Electrical duct materials (includes ducting into bases, buildings and cable crossings under access tracks/watercourses) delivered on standard HGVs;
- Deliveries for Operations Building materials (based on project experience);
- Sand for cable surround delivered by 20T capacity HGV, cable surround volume based on a trench 1.6m wide by 0.6m deep;
- Electrical cable comes in 500m drums and is delivered 6 drums per vehicle. The length of cable used to predict the associated traffic movements is the length of the access track multiplied by 3, to allow for triplex installation;
- Earth cable comes in 500m drums and is delivered 10 drums per vehicle. The length of cable used to predict the associated traffic movements is the length of the access track plus an allowance for earthing bases, operations buildings etc.; and
- Fibre optic cable comes in 2000m drums and the length of cable used to predict the associated traffic movements is the length of the access track plus an allowance for entering the operations building and substation building etc.

12.10.3 The workforce on-site will depend on the activities being undertaken but is based on the following assumptions:

- Developer Staff – assumed 1 Project Manager, 1 Site Manager, 1 Ecological Clerk of Works, 10 additional staff on part time at 2 visits per week
- Contractor Office Staff – Assumed 1 Site Agent, 2 Engineers, 2 Foremen, 1 Health & Safety Advisor, 1 Environmental Advisor, 1 Admin Assistant on site permanently
- Contractor Site Staff – equal to items of plant + 8 general operatives, 2 steel fixing squads of 4 operatives, 1 concrete squad of 5 operatives;
- Wind Turbine Supplier Staff – 1 Project Manager, 1 Site Manager, 1 Health & Safety Advisor, 10 Operatives sharing 5 vehicles; and
- Electrical Contractor Staff – 1 Site Supervisor, 5 Operatives and Plant Operators equal to number of items of plant.

Table 12.6: Construction Profile

	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Mobilisation													
Borrow Pits													
Access Track Construction													
Hardstanding Construction													
Wind Turbine Foundations													
Wind Turbine Erection													
Reinstatement													
Demobilise													

Table 12.7: Predicted Traffic Generation

	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Site Setup													
Offices	3												3
Contractor Offices	5		5										10
Contractor Storage	10												10
Wind Turbine Supplier Offices									2				2
Wind Turbine Supplier Storage									5				5
Miscellaneous Compound (cones, barriers, fencing, signage, tanks, skips etc.)	11								4				15
Contractor Plant Deliveries (incl. 7 Excav	23	2	11	4				35					5
Concrete Pump			2	4	4	4	4	2				0	0
Electrical Contractor Plant Deliveries (incl. 3 Excavators, 1 Telehandler, 2 Cable Trailers, 2 Tractors + Misc. Allowance)			10									10	0
Compound Waste (Sewage/Waste, 8 per month)	8	8	8	8	8	8	8	8	8	8	8	8	8
Fuel Deliveries (8 per month)	8	8	8	8	8	8	8	8	8	8	8	8	8

	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Construction Materials													
Concrete Sand			69	69	69	69	69	69					
Concrete Cement			13	13	13	13	14	14					
Concrete Aggregate			83	83	83	83	83	83					
Capping Material				720	720	720							
Reinforcement Steel			11	11	11	11	11	11					
Culverts													
Building Steel Frame			5										
Building Cladding, Doors, Windows, External Finishes			9										
Building Roof			0	6									
Miscellaneous Items (Cattle Grids, Snow Poles, Gates, Office Furniture etc.)		4	4	4	4	4							
Geotextiles		4											
Piles (assumed 8 bases require piles, 40 No 339mm dia. CHS)				23									
Electrical Equipment													
Electrical Cable			5	3	3	3	3	3					
Earth Cable			2	2	1								
Fibre Cable			1										
Electrical Equipment (Switchgear, transformers, cable markers etc.)						4	4		4	4	4	4	
Cable Surround Sand			251	251	251	251	251	251					
Ducts		5	5	5	5								
Wind Turbine Deliveries and Erection													
Blades									9	9	9	6	
Nacelles									3	3	3	2	
Tower Sections									9	9	9	6	
Cans									11				
Blade Hub									3	3	3	2	
Erection Crane									3			3	
Assist Crane									3			3	
Telehandlers									2			2	
Escort Vehicles (2 No.)									18	16	16	14	

	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Staff													
Staff	172	172	172	172	172	172	172	172	172	172	172	172	172
Contractor Office Staff	184	184	184	184	184	184	184	184	184	184	184	184	184
Contractor Site Staff	713	759	1311	1403	1403	1403	1403	1403	207	207	207	207	207
Wind Turbine Supplier Staff									184	184	184	184	184
Electrical Contractor Staff			368	368	368	368	368	368	368	368	368	368	
Total	**1137**	**1154**	**2536**	**3340**	**3306**	**3304**	**2581**	**2611**	**1207**	**1175**	**1175**	**1183**	**813**
HGV (including Abnormal Loads)	68	39	501	1213	1179	1177	454	484	74	44	44	54	66
Private Vehicles	1069	1115	2035	2127	2127	2127	2127	2127	1138	1136	1136	1138	747
Abnormal Loads									43	24	24	24	
HGV Daily Average	3	2	20	47	46	46	18	19	3	2	2	2	3
Private Daily Average	42	43	79	82	82	82	82	82	44	44	44	44	29
Total Daily Average	45	45	99	129	128	128	100	101	47	45	45	46	32
Hourly Average	5	5	10	14	13	13	11	11	5	5	5	5	3
2-way hourly average	9	9	21	27	27	27	21	21	10	10	10	10	7

Assessment of Residual Construction Effects

Geographical Boundary of Assessment

12.10.4 The flows at the various count sites in the study area are shown in Table 12.8 along with the predicted increase in HGV traffic at those locations, attributable to estimated levels of construction traffic. In this table, the predicted daily average number of construction vehicle trips from the predicted peak month (month 4) is compared against each ATC data site. This would represent 100% of the generated construction traffic passing each ATC location. In reality, once contractors have been appointed and materials sourced, it is expected that generated construction traffic would arrive at site using the various routes and would not pass each ATC location. As a result, the assessment included in Table 12.8 is based on a worst-case scenario.

Table 12.8: Summary of Predicted Daily Increase in Traffic at ATC Sites

Site Ref	Weekday AADF	Weekday %HGV	Weekday HGV2	Predicted Average Daily Increases			Predicted Average Daily Percentage Increases		Predicted temporary Traffic		
				HGV Traffic (two-way)	Non-HGV Traffic (two-way)	All Traffic (two-way)3	HGV Traffic (two-way)	All Traffic (two-way)	AADF	HGV	HGV%
1	1837	15%	276	92	164	256	33%	14%	2093	368	18%
2	2613	-	353	92	164	256	26%	10%	2869	445	16%
3	3878	-	524	92	164	256	18%	7%	4134	616	15%
4	4562	-	616	92	164	256	15%	6%	4818	708	15%
5	4045	-	547	92	164	256	17%	6%	4301	639	15%
6	6260	12%	752	92	164	256	12%	4%	6516	844	13%
7	6347	-	857	92	164	256	11%	4%	6603	949	14%
8	7471	-	1009	92	164	256	9%	3%	7727	1101	14%
9	7089	-	958	92	164	256	10%	4%	7345	1050	14%
10	9370	-	1265	92	164	256	7%	3%	9626	1357	14%
11	8672	-	1171	92	164	256	8%	3%	8928	1263	14%
12	11065	-	1494	92	164	256	6%	2%	11321	1586	14%
13	289	6%	18	92	164	256	513%	89%	545	110	20%
14	84	5%	5	92	164	256	1848%	305%	340	97	29%

1 Note, an average of the weekday HGV percentages from sites 1 and 6 has been used to calculate the weekday HGV's at all other A9 locations where HGV data is not available.
2 Assuming a 10-hour day, the all traffic average hourly flows equate to a maximum of 28 two-way movements.

12.10.5 The following points should be borne in mind when assessing the likely effect of these increases:

- The predicted daily average increase in traffic represents 100% of the generated construction traffic passing each ATC location, a situation which would not occur in reality;
- No traffic growth has been applied to the baseline traffic used in the assessment and, therefore, the assessment can be deemed to be robust i.e. if the existing traffic flows were factored to future year levels the calculated percentage increases would be less (e.g. an increase of 100 vehicles to a nominal existing flow of 5,000 vehicles means a percentage increase of 2.0%, whereas an increase of 100 vehicles to a nominal future year flow of, say, 6,000 vehicles means a percentage increase of 1.7%);
- The increase in traffic during the construction phase is temporary;
- The predicted temporary percentage of HGVs is within normal parameters for the A9 (T) section of the route to the Proposed Varied Development site;
- The high percentage increases in HGV traffic are as a consequence of the low number of existing HGVs on the routes recorded during the traffic surveys; and
- The percentage increases at the locations listed above are solely a result of the temporary increase in HGV traffic. This estimated increase is a total of 92 HGV two way movements on average, per day, which is equivalent to approximately 9 HGVs per hour (averaged over an

assumed 10-hour delivery period). This is not deemed to be a significant increase in real terms.

12.10.6 Considering the above bullet points, the assessment highlights that the road links and any other specifically sensitive areas where traffic flows are predicted to increase by more than that suggested in the rules taken from the IEA 1993 guidelines, and hence need to be considered further, are:

- Site Ref 1, A9 Berriedale (north of Helmsdale) – predicted 33% average daily increase in HGV traffic;
- Site Ref 2, A9 Brora to Helmsdale – predicted 26% average daily increase in HGV traffic;
- Site Ref 13, Clynelish Distillery Road – predicted 513% average daily increase in HGV traffic and a predicted 95% average daily increase in all traffic; and
- Site Ref 14, C6 Strath Brora Road – predicted 1,848% average daily increase in HGV traffic and a predicted 326% average daily increase in all traffic.

12.10.7 A comparison between the Consented Development and the Proposed Varied Development is summarised in Table 12.9.

Table 12.9: Traffic Impact between Consented Development (CD) and Proposed Varied Development (PVD)

	% change in traffic		
Receptor	**CD all Traffic (HGV)**	**PVD all Traffic (HGV)**	**Change all Traffic (HGV)**
A9 Berriedale (north of Helmsdale)	+15% (+40%)	+14% (+33%)	-1% (-7%)
Brora to Helmsdale	+10% (+31%)	+10% (+26%)	0% (-5%)
Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)	+95% (+611%)	+89% (+513%)	-6% (-98%)
C6 Strath Brora Road	+326%) (+2,200%)	+305% (+1,848%)	-21% (-352%)

(Consented Development Traffic taken from CH2M document Gordonbush Extension Wind Farm Environmental Statement, Chapter 12, Table 12.9 date June 2015)

12.10.8 On the basis that the predicted traffic increases and the actual traffic volume increases are not significant (although assessed as being high in percentage terms), it is considered that the estimated increases in traffic are unlikely to have a detrimental effect. The above road links and neighbouring communities are, nevertheless, considered further in the following sections.

Receptor Sensitivity

12.10.9 The settlements identified from the geographical boundary assessment lie on the potential access route to the site; consideration has therefore been given to the size and function of each settlement, and particular characteristics identified during the baseline review. The results are shown in Table 12.10.

Table 12.10: Receptor Sensitivity (Communities)

Receptor	**High**	**Medium**	**Low**	**Negligible**
Helmsdale		X		
Brora		X		
Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)			X	

12.10.10 The roads identified from the geographical boundary assessment, and summarised in Table 12.11, are part of the potential access routes to the site. Consideration has been given to their existing condition and ability to accommodate HGV traffic, and characteristics identified during the baseline review.

Table 12.11: Receptor Sensitivity (Roads)

Receptor	High	Medium	Low	Negligible
A9			X	
Clynelish Distillery Road		X		
C6 Strath Brora Road		X		

Effects Magnitude and Effects Significance – Severance, Fear and Intimidation

12.10.11 The increases in traffic flow affecting the receptors are summarised in Table 12.10 Based on the two-way average daily percentage increase in traffic, the percentage increase at:

- Helmsdale on the A9 is between 10% and 14% (based on the counter located between Brora (Site Ref 1) and Helmsdale (Site Ref 2);
- Brora on the A9 is between 7% and 10% (based on Site Ref 2 located at the southern boundary of Brora and Site Ref 3 located between Brora and Helmsdale); and
- The communities adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road is between 89% and 305% (based on the counters Site Refs 13 and 14).

12.10.12 Considering the indicator described in DMRB Volume 11, the magnitude of the severance effect at Helmsdale and Brora is considered slight i.e. a negligible magnitude of effect. With regard to the communities adjacent to Clynelish Distillery Road and the C6 Strath Brora Road, it can be seen that the Proposed Varied Development construction could potentially result in a high percentage increase in traffic between Brora and the site entrance. This equates to a magnitude of effect on severance at settlement receptors on this route being classed as high. However, although the percentage increase in trips is assessed as being high, the existing flow on this part of the transport route, and the additional traffic, is low in absolute terms. There are also no pedestrian facilities and, therefore, negligible pedestrian activity. As a result, professional judgement has been used to determine that the significance of the effects on severance is minor.

12.10.13 It is anticipated that journey patterns will be maintained without pedestrians being dissuaded from making trips and, therefore, this alternative assessment from DMRB reinforces the slight i.e. a negligible magnitude, severance effect.

12.10.14 To determine the magnitude of the effect on fear and intimidation the same assessment, as that undertaken for severance, has been applied. As a result, the magnitude of the fear and intimidation effect at the settlements is considered to be negligible or minor.

Effects Magnitude and Effects Significance – Driver and Pedestrian Delay

12.10.15 To inform the assessment of driver and pedestrian delay, the capacity of the surrounding road network has been considered. Delays to non-development traffic and pedestrians is related to the volume of traffic on the road network.

12.10.16 The average link capacities for the various links within the study area using the DMRB guidance indicate that the A-class roads are theoretically capable of accommodating between 800 and 1,200 vehicles per hour per direction, depending on the speed limit. To demonstrate the theoretical capacity of the Clynelish Distillery Road and the C6 Strath Brora Road they have been classified as a poor single carriageway rural road with varying width of between 4.0m – 5.5m. The theoretical capacities are described below:

- A9 – rural typical single 7.3m, 60mph = 1,200 vehicles per hour per direction;

- A9 – urban single 7.3m, 30mph = 800 vehicles per hour per direction;
- Clynelish Distillery Road – rural poor single 5.5m, 60mph = 800 vehicles per hour per direction; and
- C6 Strath Brora Road – rural poor single 4.0m, 60mph = 140 vehicles per hour per direction.

12.10.17 Using the 800 and 1200 vehicles per hour per direction for the A9, this equates to a combined (two-way) theoretical capacity of 1,600 and 2,400 vehicles per hour, and these values are used as a minimum and maximum capacity limit to compare with the recorded flows from the ATC surveys. The comparison has been made between the theoretical capacity and the annual average PM peak flows recorded, and there is significant spare capacity on all links and, therefore, adding the estimated project construction traffic, estimated at 26 vehicles per hour (two way flow), is unlikely to have any detrimental effect on capacity.

12.10.18 Using the values of 140 and 800 vehicles per hour per direction, for the C6 Strath Brora Road and Clynelish Distillery Road respectively, this equates to a combined (two-way) theoretical capacity of 280 and 1,600 vehicles per hour, and these values are used as a minimum and maximum capacity limit to compare with the recorded flows from the ATC surveys. The comparison has been made between the theoretical capacity and the average weekday hourly flows recorded at sites 13 and 14. There is significant spare capacity and adding the project construction traffic, estimated at 26 vehicles per hour (two way flow), is unlikely to have any detrimental effect on capacity.

12.10.19 Based on the above assessment, it has been determined that the magnitude of the effects on driver and pedestrian delay will be negligible

Effects Magnitude and Effects Significance – Pedestrian Amenity

12.10.20 The magnitude of the effect on pedestrian amenity has been considered in terms of the threshold described in the Guidelines for the Environmental Assessment of Road Traffic which suggests that a meaningful change in amenity would be where traffic flow (or its HGV component) is halved or doubled. Hence, based on the estimated two-way average daily percentage increase in construction traffic and the estimated two-way average daily percentage increase in HGV traffic, it can be seen that the Proposed Varied Development construction traffic could potentially see a more than two-fold increase in HGV and all traffic on the Clynelish Distillery Road and the C6 Strath Brora Road between Brora and the site entrance. This equates to a magnitude of effects on pedestrian amenity at settlement receptors on this route being classed as high. However, although the percentage increase in trips is assessed as being high, the additional traffic is low in absolute terms and, as indicated above, this route has significant spare capacity, as well as there being no pedestrian facilities and, therefore, negligible pedestrian activity. As a result, professional judgement has been used to determine that the significance of the effects on pedestrian amenity is minor.

Effects Magnitude and Effects Significance – Accidents and Safety

12.10.21 The increase in traffic volume associated with the Proposed Varied Development is the main factor in the potential increase in risk regarding accidents and safety. Another potential effect on road safety is the transfer of dirt and debris from the site and associated vehicles onto the surrounding road network. However, there is no threshold assessment to determine the significance of the effects of the construction related traffic. Given that the increased traffic levels are temporary and the mitigation measures that are required to be employed to minimise these effects such as: regular monitoring of the road conditions; the traffic management plan; and abnormal vehicle escorts, there is unlikely to be a determinable increase on the risk of accidents. As a result, the magnitude of the accidents and safety effects has been determined as being low at all sensitive settlement receptors.

Summary

12.10.22 The magnitude of the effect of the construction traffic on the road and junction sensitive receptors has been based solely on traffic volumes and is summarised in Table 12.12 The magnitude of the effect at all receptors as a result of the estimated construction traffic volumes has been determined as being low as the additional movements, although on some roads assessed as being statistically high, are low in absolute terms.

12.10.23 Based on the magnitude of the effects and the sensitivity of the receptors, Table 12.13 summarises the significance of the additional construction related traffic movements during the construction phase.

Table 12.12: Receptor Sensitivity (Roads)

Receptor	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Accidents and Safety	Road Capacity
Helmsdale	negligible	negligible	negligible	negligible	negligible	low	-
Brora	negligible	negligible	negligible	negligible	negligible	low	-
Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)	negligible	negligible	negligible	negligible	negligible	low	-
A9	-	-	-	-	-	-	low
Clynelish Distillery Road	-	-	-	-	-	-	low
C6 Strath Brora Road	-	-	-	-	-	-	low

Table 16.13: Receptor Sensitivity (Significance)

Receptor	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Accidents and Safety	Road Capacity
Helmsdale	no	no	no	no	no	minor	-
Brora	no	no	no	no	no	minor	-
Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)	no	no	no	no	no	minor	-
A9	-	-	-	-	-	-	no
Clynelish Distillery Road	-	-	-	-	-	-	minor
C6 Strath Brora Road	-	-	-	-	-	-	minor

12.11 Cumulative Effects

12.11.1 The consultation responses did not highlight any other significant projects in the area that would have an overlapping construction phase with the Proposed Varied Development, nor alter the baseline to be assessed in this chapter.

12.11.2 It is noted that the proposed West Garty Wind Farm, which was at application stage at the time of the 2015 ES and the 2016 FEI, was refused on 19 October 2018, subsequent to the cumulative cut-off date (30th September 2018).

12.11.3 No other schemes are noted of being of significance and as such, no cumulative assessment has been undertaken.

12.12 Comparison of Effects between Proposed Varied Development and Consented Development

12.12.1 A comparison between the potential significance of effects between the Proposed Varied Development (PVD) and the Consented Development (CD) has been undertaken and is summarised in Table 12.14. This clearly illustrates that there is no increase in effect or effect significance as a result of the use of the larger diameter turbines (and the associated infrastructure changes).

Table 12.14: Receptor Sensitivity (Significance) Comparison (PVD in BOLD, CD in Italics)

Receptor	Severance	Driver Delay	Pedestrian Delay	Pedestrian Amenity	Fear and Intimidation	Accidents and Safety	Road Capacity
Helmsdale	**no** *no*	**no** *no*	**no** *no*	**no** *no*	**no** *no*	**minor** *minor*	-
Brora	**no** *no*	**no** *no*	**no** *no*	**no** *no*	**no** *no*	**minor** *minor*	-
Adjacent to the Clynelish Distillery Road and the C6 Strath Brora Road (Killin; Oldtown; Kilcalmkill; Gordonbush)	**no** *no*	**no** *no*	**no** *no*	**no** *no*	**no** *no*	**minor** *minor*	-
A9	-	-	-	-	-	-	**no** *no*
Clynelish Distillery Road	-	-	-	-	-	-	**minor** *minor*
C6 Strath Brora Road	-	-	-	-	-	-	**minor** *minor*

12.13 Conclusion

12.13.1 This Chapter has assessed the likely significance of effects of the traffic associated with the Proposed Varied Development during construction. The assessment of the residual effects has been based on: existing traffic data; the estimated volume of construction traffic; the methodology outlined; and the implementation of mitigation measures, such as an appropriate traffic management plan and suitable liaison with the relevant authorities. The residual traffic and transport effects are temporary and have been assessed as having no significant effect. This is the same conclusion as for the Consented Development.

12.14 References

Design Manual for Road and Bridges (DMRB) Volume 11, Environmental Assessment, Section 3, Environmental Assessment Techniques, Part 8, Pedestrians, Cyclists, Equestrians and Community Effects. June 1993. Highways Agency;

Design Manual for Roads and Bridges (DMRB) Volume 15 Part 5: Traffic Modelling in NESA (Network Evaluation from Surveys and Assignment), Chapter 3. July 2005. Highways Agency;

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