Chapter 14
Construction and Operational Noise

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14 Construction and Operational Noise

Introduction

14.1 This chapter presents the findings of the assessment of the likely significant construction and operational noise effects of the proposed Kendoon to Tongland 132 kilovolt (kV) Reinforcement Project ('the KTR Project'), details of which are provided in **Chapter 4: Development Description** and **Chapter 5: Felling, Construction, Operational Maintenance and Decommissioning**. The assessment follows the guidance from national standards by deriving potential thresholds for significant effects based on likely levels of existing and construction noise at sensitive receptors. This chapter has been authored by Hoare Lea.

14.2 Planning policies of relevance to this assessment are provided in **Chapter 6: Planning Policy Context**. The general approach for the assessment and consideration of mitigation measures is described in **Chapter 3: Approach to the EIA**.

14.3 **Appendix 14.1**: Baseline Noise Survey presents the detailed results of a background noise survey and is referenced and summarised in this chapter.

Scope of the Assessment

14.4 On the basis of the desk-based work undertaken, the professional judgement of the EIA team, experience from other relevant projects, policy guidance and standards, and feedback received from consultees, a number of potential effects have been 'scoped out' of detailed assessment, as proposed in the Scoping Report and as noted in **Table 14.1** and detailed further below.

Table 14.1: Effects Scoped in and Scoped Out

Connection	Potential Effects Scoped in to Detailed Assessment	Potential Effects Scoped out of Detailed Assessment
Polquhanity to Glenlee via Kendoon (P-G via K)	• Ancillary construction works such as laying of underground cable for undergrounding of the existing 11kV overhead line (OHL), access track and compound construction, quarrying and felling (including secondary effects due to windthrow felling); • Effects associated with removal of the existing OHLs along the N and R Route (north of Glenlee); • Operational noise generated by corona discharge associated with the proposed OHL; and • Cumulative effects of ancillary works and operational noise	• Noise associated with the construction of towers and commissioning of the proposed OHLs; • Noise associated with the removal of the wood poles of the existing 11kV OHL; • Noise associated with changes in road traffic flows on existing roads during construction and operation; and • Vibration caused during construction or operation of the OHLs (except for vibration associated with quarry blasting).
Carsfad to Kendoon (C-K)	• Ancillary works, such as access track construction and felling; • Operational noise generated by corona discharge associated with the proposed OHL; and • Cumulative effects of ancillary works and operational noise	
Earlstoun to Glenlee (E-G)	• Ancillary works, such as access track construction, felling and the laying of the short section of underground cable; • Operational noise generated by corona discharge associated with the proposed OHL; and • Cumulative effects of ancillary works and operational noise	
BG Route Deviation (BG)	• Ancillary works, such as felling; • Operational noise generated by corona discharge associated with the proposed OHL; and • Cumulative effects of ancillary works and operational noise	
Glenlee to Tongland (G-T)	• Ancillary works, such as access track construction, felling and quarrying; • Effects associated with removal of the existing OHL along the R Route (south of Glenlee); • Operational noise generated by corona discharge associated with the proposed OHL; and • Cumulative effects of ancillary works and operational noise	
KTR Project as a Whole	• Combined effects of ancillary works and/or removal work on proximal properties for multiple connections being constructed concurrently; and • Cumulative effects of combined schemes within 1km Study Area.	

14.5 The noise generated by construction activities associated with the erection of the OHLs (namely activities associated with the delivery, foundation construction, assembly and erection of towers/poles and tower/pole conductor 'stringing') will involve relatively quieter operations of short duration, with associated noise levels which quickly diminish as construction progresses, moving the activity further away from noise-sensitive locations. This potential noise effect on fixed receptors, such as residential properties, associated with each connection of the KTR Project has therefore been scoped out of the assessment.

14.6 Whilst noise associated with the removal of existing towers will also quickly diminish as works progress, disassembling existing towers and breaking existing concrete foundations will involve noisier activities to tower erection and therefore this type of activity has been scoped in. However, the proposed removal of the wood poles of the existing 11kV line (associated with P-G via K), will largely use existing access and involve localised work of very short duration which will move quickly away: these have been scoped out.

14.7 Any longer duration construction related activities, such as access track and construction compound construction, felling, quarrying, the laying of the underground cable (for E-G and the 11kV cable undergrounding for P-G via K) and the construction of working areas, hereafter referred to as ancillary works, have also been scoped into the assessment.

14.8 The connections comprising the KTR Project will be accessed by different access points which are spread around the project area and are geographically separate. As a result, the construction traffic movements will be distributed over the existing road network and proposed access tracks throughout the construction programme. As such, any increase in traffic associated with these works is unlikely to be sustained in such a way that it would represent a significant noise effect. This potential noise effect associated with each connection of the KTR Project has therefore been scoped out of the assessment, as agreed as part of the initial consultation (see **Table 14.2**).

14.9 The nature of works and distances between the connections comprising the KTR Project and potential receptors are such that the risk of significant effects relating to ground borne vibration are very low (quarry blasting is considered below). Occasional momentary vibration can arise when heavy vehicles pass dwellings at very short separation distances, but this is not sufficient to constitute a risk of significant effects. Accordingly, vibration impacts during ancillary work construction do not warrant detailed assessment and were therefore scoped out. With the exception of the potential for quarry blasting activities, none of the infrastructure which forms part of the KTR Project during operation is likely to generate substantial levels of vibration and so this aspect is also scoped out.

14.10 In each section of this chapter (i.e. for each individual connection), the noise effects of the different activities associated with the proposed construction works for that connection (and which form part of the above scope), are first considered each in turn for relevant receptors. The potential for multiple

construction activities associated with that connection to combine and result in increased effects (where relevant) is then considered.

14.11 Under ideal weather conditions, transmission lines would generally not produce audible noise. But in wet weather, the presence of protrusions on the conductor surface (such as water droplets) can cause electric fields to propagate in the air (so-called 'corona discharge') which can be a source of noise, albeit at relatively low level. This may occur in wet conditions (fog, snow or mainly rain) or if debris are present on the line. This noise will often include a low hissing and/or crackling character, with the additional presence of a hum (tonal) in heavy rain. The generation of this noise is minimised as part of modern OHL design. Although no significant noise effects from the operation of such 132kV OHL are expected, to present a robust assessment a quantitative assessment of the associated impacts has been included in this chapter.

14.1 In each section, the cumulative inter-connection effects of each connection in relation to the other connections (collectively comprising the KTR Project as a Whole) and other developments is also specifically considered, for both construction and operation noise. It should be noted that due to the localised geographic area for noise effects, no other developments (i.e. non-KTR Project) are located within the noise Study Area and the timing of construction of the Glenlee substation extension does not overlap with KTR Project construction. Therefore, the findings of the cumulative assessment essentially reflect the findings of the KTR as a Whole assessment, and the findings of this assessment is cross-referred to for each connection, to avoid duplication of assessment text. When considering the KTR Project as a whole, the assessment also considers combined effects of multiple connections being constructed and operated concurrently at neighbouring sensitive receptors, and subsequently, the cumulative inter-KTR effects of the KTR Project as a whole with other developments[1].

Assessment Methodology

Legislation and Guidance

Legislation

14.2 This assessment is carried out in accordance with the principles contained within the following legislation:

- The Environmental Protection Act 1990; and
- The Control of Pollution Act 1974.

Guidance

14.3 This assessment is carried out in accordance with the principles contained within the following documents:

- Scottish Government (2014), Scottish Planning Policy (SPP);
- Scottish Government (2011). Planning Advice Note (PAN) 1/2011: Planning & Noise;
- PAN50 (1996) Controlling the Environmental Effects of Surface Mineral Workings';
- British Standards Institution (2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (BS 5228-1);
- British Standards Institution (2014) Code of practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration (BS 5228-2);
- British Standards Institution (2014, amended 2019) - Methods for rating and assessing industrial and commercial sound (BS 4142);
- British Standards Institution (2003) Description and measurement of environmental noise — Part 1: Guide to quantities and procedures (BS 7445-1); and
- British Standards Institution (2014) Guidance on sound insulation and noise reduction for buildings (BS 8233).

Consultation

14.4 In undertaking the assessment, consideration has been given to the scoping responses and other consultation as undertaken as detailed in **Table 14.2**.

Table 14.2: Consultation Responses

Consultee and Date	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Scottish Government – Energy Consents Unit (ECU)	Scoping response	The ECU agreed with the approach proposed for the assessment of construction noise as set out in the Scoping Report, consistent with that presented in **Table 14.1** above. The potential impact of noise associated with the decommissioning of the N and R Routes was raised.	The assessment approach presented in the chapter is consistent with the scoping response received.
Dumfries and Galloway Council (D&GC)	Scoping response	No comments made regarding construction or operational noise.	Noted.
Transport Scotland	Scoping response	Agreed that noise effects associated with temporary construction traffic can be scoped out of the assessment.	The assessment approach presented in the chapter is consistent with the scoping response received.

Study Area

14.5 Noise propagation is affected by a number of factors but tends to be mainly related to separation distance between the source and noise-sensitive receptors. Based on the proposed construction activities and assessment criteria considered in the assessment, as well as experience of the assessment of construction and operation of similar developments, the potential for any significant effects is considered unlikely beyond 300m. The Study Area for construction effects was therefore limited to 300m from all ancillary components of the KTR Project *i.e.* temporary construction compounds, working areas, access tracks and areas of construction or decommissioning activity. At distances greater than 300m, noise levels associated with these activities would be below the lowest thresholds for construction noise significance and therefore do not warrant specific consideration, and therefore noise-sensitive receptors beyond this Study Area are not considered further in this chapter for the assessment of construction noise.

14.6 For operational noise, to provide a quantitative assessment of noise levels associated with the operation of the proposed OHLs, locations representative of the closest noise-sensitive receptors were selected for each of the individual connections comprising the KTR Project. In most cases, these were properties already identified within the 300m Study Area described above; however, in some cases, additional properties outside this Study Area were selected in order to provide representative operational noise levels for certain individual connections: this is the case for example for Airie Cottage and Hill Drop Lodge along the G-T connection.

14.7 As the effects of temporary construction traffic have been scoped out, it was not considered necessary to consider the potential for effects on receptors located on the construction traffic route(s) and surrounding area.

14.8 **Table 14.3** below identifies all the relevant representative noise-sensitive locations identified: this list is not intended to be exhaustive but sufficient to be representative of noise levels typical of those receptors closest to the proposed works and OHLs for each connection comprising the KTR Project. **Table 14.3** only includes highly sensitive receptor locations (residential dwellings), no other less-sensitive receptors (as outlined in **Table 14.4**) were identified as relevant in the Study Area. The receptor locations are also illustrated on **Figure 14.1**.

[1] No other developments are proposed within the noise Study Area which interact cumulatively with the KTR Project.

Table 14.3: Representative Noise Receptor Locations

ID	Location	Easting	Northing	Relevant Connection
1	High Carminnows	259167	589959	
2	Dalshangan Lodge	259514	588871	
3	Karnak	259577	588727	
4	Polmaddie Farm	259906	588076	
5	4, Dalshangan Road (Dundeugh)	259947	587949	
6	The Cabin/Deughside	259742	588001	
7	Phail Barcris, Dalry	259908	587642	
8	Stonebyres (Kendoon)*	260487	587623	
9	Afric (Kendoon)*	260559	587642	
10	Kinross (Kendoon)*	260512	587584	P-G via K
11	Stroangassel Farm*	260374	586749	
12	Carsfad Cottage*	260467	585456	
13	Inverharrow	260503	584209	
14	Barkeoch Mains	260816	583288	
15	Alangibbon Cottages*	261585	582076	
16	Staffa*	261392	581768	
17	Waterside*	261240	580996	
18	Carville (Glenlee)*	260709	580452	
19	Dunston (Glenlee)*	260720	580443	
8	Stonebyres (Kendoon)*	260487	587623	
9	Afric (Kendoon)*	260559	587642	
10	Kinross (Kendoon)*	260512	587584	C-K
11	Stroangassel Farm*	260374	586749	
12	Carsfad Cottage*	260467	585456	
15	Alangibbon Cottages*	261585	582076	
16	Staffa*	261392	581768	
17	Waterside*	261240	580996	E-G
18	Carville (Glenlee)*	260709	580452	
19	Dunston*	260720	580443	
18	Carville (Glenlee)*	260709	580452	
19	Dunston*	260720	580443	
20	Navaar (Glenlee)*	260668	580348	BG
21	Blackbank (Glenlee)*	260631	580177	
17	Carville (Glenlee)*	260709	580452	
18	Dunston*	260720	580443	
20	Navaar (Glenlee)*	260668	580348	
21	Blackbank (Glenlee)*	260631	580177	G-T
22	Boatknowe	262297	580172	
23	Mallard Cottage (Grennan)	263814	579747	
24	Black 'O The Eye	264274	578269	
25	Killochy Farm	264956	576914	
26	Airie Cottage	261053	578546	
27	Darsalloch	260788	577021	
28	Brennan Cottage	265459	571982	
29	Mosscroft	265804	575008	
30	Ken Tor	266213	573791	
31	Nether Ervie Farm/Cottage	267370	572741	
32	Fominoch Cottage	269445	571275	
33	Craigend	264377	577313	
34	Auchenhay	271298	565772	
35	Drumlane Farm	270893	564107	
36	Neuk Farm	270841	563217	
37	Glentoo Farm/Cottage	270637	562015	
38	Culcrae	269738	560537	
39	Upper Balannan Farm and Cottages	270170	558980	
40	The Upper Cottage (Argrennan Mains)	269959	556634	
41	Woodlands (Argrennan Mains)	269769	556712	
42	Hilldrop Lodge	269912	555475	
43	High Clachan	269809	555076	
44	Meikleyett House	269595	553880	
45	Langbarns	269439	553790	
46	Weir House	269418	553735	
47	Meikleyett	269605	553982	
48	Lynnbank	269632	553687	
49	Ashton	269377	553538	

** Properties considered for more than one connection.*

Desk Based Research and Data Sources

14.9 The recommendations detailed in BS 5228-1[2] have been used in setting appropriate thresholds of potential significance for construction noise experienced at dwellings (see section below on assessing significance). The area covered by the KTR Project is very large and it would not be either feasible or generally necessary to measure existing noise levels across it. Given the largely rural nature of the surrounding area, as a worst-case approach, the most stringent construction noise limits have been applied assuming quiet levels of existing noise.

14.10 Ordnance Survey, online satellite imagery and address mapping data has been reviewed to determine the location of noise-sensitive receptors in the Study Area.

14.11 Construction noise will arise through the operation of large items of plant such as excavators, piling and dump trucks. Miscellaneous equipment including compressors, hand tools and generators will also be required. However, these have a significantly lower noise output than the larger items of plant and much of this type of equipment is used intermittently.

[2] British Standards Institution, British Standard 5228-1+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1 Noise, 2009.

14.12 Equipment sound power levels typically range from L_{WA} 100dB to L_{WA} 120dB depending on type and operation mode. As the specific construction details or makes and models of equipment are not known at this stage, typical source noise data for the construction plant have been obtained from information in BS 5228-1. This gives an indication of noise levels from construction plant taken from measurements at various sites. Using this data and the combinations of plant likely to be operating (based on the outline construction programme detailed in **Chapter 5**), a series of aggregate sound power levels have been produced for each key activity of construction related to ancillary works (**Table 14.7**).

14.13 The assessment considers potential effects associated with construction of new tracks within 300m of residential receptors as a 'worse-case' scenario. However, following pre-construction ground investigations, tracks may not require construction if the ground is solid and dry and where temporary wood or steel matting could be used instead. Other types of tracks include 'floating tracks' on areas where peat is more than 1m deep, and where low pressure vehicles will be used (further details are provided in **Chapter 5**).

14.14 Available research and guidance on predictions of audible noise from corona discharge from transmission lines was considered. For each of the OHL types proposed as part of the KTR project, conductor dimensions and predicted values of the conductor surface voltage gradients were provided by SP Energy Networks (SPEN) as input to the operational noise predictions.

14.15 To estimate potential background noise levels in wet weather conditions, reference was made to research by Miller (1978)[3] as referenced in guidance issued by the National Grid[4]. Information from the Met Office suggests that in the region considered, a rainfall rate of at 0.7mm/hr would be typical[5]. In these conditions, representative of typical foul weather, the Miller curves indicates that noise levels in the region of 30 to 35dB(A) would be likely, even with limited presence of foliage around a property. This is therefore indicative of background levels in these conditions, discounting the increase in background noise levels that will occur in windy conditions. This is considered typical in our experience of quiet rural areas such as that of the KTR Project. Note that local sources such as the presence of watercourses or large vegetation will tend to further increase background noise levels.

Field Survey

14.16 The KTR Project includes areas of both rural and built environments. The existing baseline noise environment in rural areas is predominantly characterised by 'natural' sources such as wind disturbed vegetation with some contribution from anthropogenic sound such as distant road traffic and agricultural activity. Several sections of the KTR Project either pass over or alongside main A-roads and the location of all existing substations are also near to such roads. The existing day-time baseline noise environment in these areas is considered to be characterised by road traffic vehicles using the nearby roads.

14.17 As outlined above, there would have been considerable practical difficulties associated with undertaking baseline noise surveys over the large Study Area involved. Furthermore, this was not considered necessary for the assessment of construction noise, on the basis that a quiet rural character was generally assumed on a 'worst-case' basis. For the assessment of operational noise, given the limited impacts generally expected from a 132kV OHL, there was also no need in general to quantify baseline noise levels at the properties studied, via background noise surveys.

14.18 The only exception is the Stonebyres property, which currently has two OHLs (from the N and R Route (north)) overhead or in close proximity which are proposed to be replaced as part of the P-G via K and C-K connections of the KTR Project. On this basis a background noise survey was undertaken to inform the detailed assessment. **Appendix 14.1** presents the results of the baseline noise survey undertaken at this property for a period of more than one week. A noise meter was installed in the garden area of the property. The survey included periods of varying rainfall and allowed to estimate levels of noise currently experienced at the property, including noise from the existing OHLs in particular during and following rainfall.

14.19 For example, instances of noise character typical of that from corona discharge on an OHL was observed in some instances at this property during and following rainfall, with measured levels around 30-35dB L_{Aeq} during these periods. Typical background noise levels during and following rainfall varied between 30-35dB L_{A90} and above. Increased background levels of between 47-57dB L_{A90} during most of the day were observed in two instances during the survey period, likely associated with increased water flow in the Water of Ken due to operation of the nearby Hydro power station.

Assessing Significance

Sensitivity

14.20 Sensitivity of receptors has been classified into the following categories as presented in **Table 14.4** for a range of different receptor types and has been informed by professional judgement. These categories have been determined based on the guidance contained in BS 5228-1. Residential receptors are classed as high sensitivity, according to the classification system adopted for this assessment.

Table 14.4: Sensitivity of Receptors

Sensitivity	Receptor Description
High	Dwellings (e.g. houses, flats and apartments, as well as residential healthcare) and educational establishments (e.g. schools and colleges, residential and non-residential).
Medium	Non-residential healthcare and hospitals, including facilities with wards for patients to stay for a few weeks. Places of worship.
Low	Commercial facilities (e.g. retail, office developments).
Very Low	Industrial Receptors (e.g. workshops, warehouses)

Magnitude – construction noise

14.21 BS 5228-1 provides guidance on a range of considerations relating to construction noise. BS 5228 informative Annex E provides example criteria that may be used to consider the magnitude of construction noise impacts. These criteria do not represent mandatory limits but rather a set of example approaches intended to reflect the type of methods commonly applied to construction noise. The example methods are presented as a range of possible approaches according to: the ambient noise characteristics of the area in question; the type of development under consideration; and the expected hours of construction activity. In broad terms, the example criteria are based on a set of fixed limit values which, if exceeded, may result in a significant effect unless ambient noise levels are sufficiently high to provide a degree of masking of construction noise.

14.22 The range of guidance values detailed in BS 5228 Annex E have been used to define numerical values that correspond to magnitude levels, as per **Table 14.5**. This assumes an area of rural character, with relatively low baseline noise levels, as described above. This represents a conservative basis for the assessment.

14.23 The presented effect levels have been normalised to free-field[6] daytime noise levels occurring over a time period, T, equal to the duration of a working day on site. BS 5228 Annex E provides varied definitions for the range of daytime working hours, which can be grouped for equal consideration. The values presented in **Table 14.5** relate to daytime hours from 07:00 to 19:00 on weekdays, and 08:00 to 13:00 on Saturdays (based on the guidance in BS 5228-1).

Table 14.5: Magnitude of Construction Noise Effects

Magnitude	Noise Level, dB $L_{Aeq, T}$		Description
	4 weeks or more	1-4 weeks	
High	> 75	> 85	Trigger level for noise insulation works, or cost thereof, as set out in E.4 of BS 5228-1.
Medium	> 65 ≤ 75	> 75 ≤ 85	Most stringent threshold value for potential significant effect given in Annex E of BS 5228 for example methods relevant to Proposed Development is exceeded.
Low	> 55 ≤ 65	> 65 ≤ 75	Noise is likely to be audible, but unlikely to change behaviour. BS 5228-1 thresholds not exceeded.

[3] Miller, L.N., 1978: "Sound Levels of Rain and Wind in the Trees", Noise Control Engineering, Vol. 11, No. 3.

[4] National Grid, Technical Report TR(T)94, "A method for assessing the Community Response to Overhead Line Noise", October 1993.

[5] For the area of the Site, at least 1200 mm annual rainfall would be expected with more than 900 wet hours (defined as those with at least 0.2 mm/hr of rainfall), based on the 2001-2010 average.

[6] Free-field conditions describe a location where noise is not affected by reflections from surfaces other than the ground.

Magnitude	Noise Level, dB $L_{Aeq, T}$		Description
Very Low	≤ 55	≤ 65	At least 10dB below the most stringent criterion provided in BS 5228-1.

14.24 The example criteria provided in the BS 5228-1 guidance relate to noise levels associated with construction activities lasting for sustained periods, but the duration of exposure to the noise represents a key consideration in practice. As noted in PAN50, where noise levels may be higher than usual for brief periods, but which would not represent a sustained temporary impact, effects can be considered separately. As set out in **Table 14.5,** when construction activities would occur for less than 4 weeks in a year, but more than 1 week, this corresponds to a reduction in the magnitude of effects. For example, noise levels of 72dB that are predicted to last for more than four weeks in a year are considered to be associated with medium magnitude effects. However, if this noise-producing activity were to occur for less than four weeks (but more than one week), this would be associated with effects of low magnitude. Construction noise levels lasting one week or less would be in practice unlikely to be associated with any significant effects: they would be similar for instance to road maintenance works, and associated effects would have a low magnitude at most.

14.25 The magnitude of effect may increase if noisy work is likely to occur outside of the construction hours assumed as the basis of the magnitude criteria of **Table 14.5**, for example work on Saturday afternoons or on Sundays. The general working hours proposed in **Chapter 5** are 07.00 to 19.00 in summer (April to September) and 08.00 to 17.00 (or as daylight allows) in winter (October to March). There is therefore the potential for increased effects to occur due to construction work on Saturday afternoons or on Sundays and this is taken into account in the present chapter.

Blasting operations

14.26 Blasting may be employed for stone extraction and this requires separate consideration. These activities are best controlled following the use of good practice during the setting and detonation of charges, as set out below, rather than on a predictive or quantitative analysis.

14.27 Blasting operations can generate airborne pressure waves or "air overpressure". The relevant guidance documents such as PAN50 advise controlling air overpressure (and hence noise from blasting) through the use of good practices during the setting and detonation of charges as opposed to absolute limits on the levels produced. This is because of the difficulties in predicting noise and air overpressure resulting from blasting operations (which are described in BS 5228-2); therefore, no absolute limits for air overpressure or noise from blasting are presented in this assessment.

14.28 The transmission and magnitude of ground vibrations associated with blasting operations at quarries are also subject to many complex influences including charge type and position, and importantly, the precise nature of the ground conditions (material composition, compaction, discontinuities) at the source, receiver, and at every point along all potential ground transmission paths. Clearly any estimation of such conditions is subject to considerable uncertainty, thus limiting the utility of predictive exercises. Mitigation of potential effects of these activities is best achieved through onsite testing processes carried out in consultation with D&GC.

14.29 In accordance with the guidance in PAN50 Annex D, ground vibration caused by blasting operations will be considered acceptable if peak particle velocity (PPV) levels, at the nearest sensitive locations, do not exceed 6mm/s for 95% of all blasts measured over any six month period, and no individual blast exceeds a PPV of 12mm/s. These criteria would be referenced as part of any testing procedure undertaken as part of the quarrying activities during the construction phase, and this could be secured through planning conditions for KTR Project. In some cases, for example if the separation distance from the nearest residential property is 2km or more, the associated effects are unlikely to be significant and, in agreement with D&GC, these testing procedures may be scoped out.

Magnitude – operational noise

14.30 As proposed in the Scoping Report, noise from the proposed OHLs has been assessed using the methodology of BS 4142 (2014, amended 2019)[7]. This BS provides an objective method for rating the likelihood of complaint from, or sources of sound of, an industrial and/or commercial nature. The assessment is mainly made by comparison of a rating noise level to background noise levels that prevail on a site, when assessed outdoors. The rating level is the source noise level (either measured or predicted) corrected for tone or character (if necessary).

14.31 The difference is compared to the following criteria to evaluate the impact:

- a difference of around +10dB or more is likely to be an indication of a significant adverse effect, depending on the context (medium or high magnitude);
- a difference of around +5dB indicates is likely to be an indication of an adverse effect, depending on the context (low magnitude); and
- where the rating level does not exceed the background noise level, this is an indication of the specific sound source having a low impact, depending on the context (very low magnitude).

14.32 However, BS 4142 notes that the absolute level of the sound may be in some cases more important than its relative level compared to the background, particularly when levels are low and at night. When assessing absolute noise levels, reference can be made to general guidance in BS 8233 (2014), which is itself based on available research on human response to noise. This guidance notes that internal ambient noise levels (average noise levels within habitable rooms) of 30dB(A) or less would be suitable for residential purposes, even considering bedrooms at night-time. To estimate indoor noise levels from outdoor noise levels, it is possible to consider that an opened window will provide a reduction of at least 10 dB(A). Therefore, noise levels of less than 40dB(A) would be considered low in absolute terms, and noise levels below 30dB(A) very low. In addition, the hearing threshold is around 0dB(A).

14.33 In cases where noise from an existing OHL currently affects a receptor, it is more relevant to consider the relative change in noise levels introduced by the KTR Project. In general, and outside of carefully controlled conditions, increases of less than 3dB(A) in the noise levels from a specific source are difficult to discern (guidance is provided on that basis in PAN 1/2011) And therefore such a change would represent a negligible difference and therefore correspond to a very low effect. Increases of more than 3, 5 or 10dB would correspond to low, medium and high effect magnitudes respectively.

Significance

14.34 The predicted significance of the effect determined based on professional judgement, considering both sensitivity of receptor and magnitude of change as detailed in **Table 14.6** below. **Major** and **moderate** effects are considered significant in the context of 'the 2017 EIA Regulations (as amended)'[8].

Table 14.6: Construction Noise Effect Significance

Magnitude	Sensitivity			
	High	Medium	Low	Very Low
High	Major	Moderate	Minor	None
Medium	Moderate	Minor	Minor	None
Low	Minor	Minor	None	None
Very Low	None	None	None	None

Noise Prediction Methodology and Assumptions

Construction noise

14.35 The assumed construction plant sound emission levels (sound power level, L_{wA}) are set out below in **Table 14.7**. These emission levels account for a number of different plant items operating simultaneously for each task, and generally assume that each item of plant operates for 100% of the working time for the task. These emission levels will therefore likely overestimate actual emissions that occur in practice.

Table 14.7: Activity Sound Emission Levels (L_{wA}) for Key Tasks

Task Name	Activities/equipment	Upper Activity Sound Emission, L_{wA} dB
Construct Temporary Site Compound	Excavators, dump trucks, tippers, rollers and delivery trucks	120

[7] British Standards Institution, British Standard 4142-1+A1:2019 Methods for rating and assessing industrial and commercial sound, 2014.

[8] The Electricity Works (Environmental impact Assessment) (Scotland) Regulations 2017 (as amended)

Task Name	Activities/equipment	Upper Activity Sound Emission, L_{wA} dB
Lay Underground Cable (short section of E-G and 11kV OHL P-G via K)	JCB vehicles, saws, hydraulic breaker, dump trucks, tipper, wacker plate, tandem roller, tractor and cable drum trailer and delivery trucks	115
Forestry Felling	Harvesters and forwarders, characterised by saw noise and diesel engine noise emissions commonly associated with tractors and excavation noise	115
Quarrying	Primary and secondary stone crushers, excavators, screening systems, pneumatic breakers, conveyors	125
Construction of working Areas	Excavators, hydraulic peckers, cranes, dump trucks, tippers and delivery trucks	120
Access Tracks construction	Excavator, dump trucks, tippers, dozers and vibrating rollers	120
Removal of Existing Towers (N and R Routes)	Excavators, hydraulic peckers, disc cutting, dump trucks, tippers and delivery trucks	114

14.36 The emission levels set out in **Table 14.7** have been used to calculate worst-case noise levels at residential properties within the Study Area for ancillary construction works (within 300m). The BS 5228-1 prediction model used is the static plant sound power level method. The predictions have been based on the soft ground cover methodology provided by the Standard as appropriate for the rural development environment. Construction noise levels have been calculated at the nearest noise sensitive receptors to each activity. At each receptor location, the calculations have been made at a height of 4m above local ground level to account for the noise level occurring at first floor window level. This represents a worse case approach, as calculations at heights nearer to ground level would be lower due to the increased attenuation effect associated with the ground. Calculations were made at a distance of 5m from the closest receptor façades to represent outdoor amenity areas.

14.37 Predictions are first made for each of the ancillary construction activities considered in isolation, and the potential combined effects of different ancillary works on receptors within each connection are considered where relevant, *i.e.* where they may overlap.

Operational noise

14.38 As discussed above, conductor dimensions and estimated values of the conductor surface voltage gradients were used as input to the operational noise predictions. The predictions of audible noise levels were made using an empirical model[9]. This model predicts L_{50} noise levels, *i.e.* levels predicted to be exceeded for 50% of the time at each receptor location considered, based on the separation distance between the OHL and the receptor. The model initially predicts noise levels in under 'foul' weather conditions, in which production of noise from corona discharge is more likely to occur. Under fair weather conditions, the model indicates that noise levels would be 25dB quieter.

14.39 Predictions were undertaken assuming, as a 'worst-case', that each OHL was located at the minimum height of 6.7m from the ground (due to sag effects) and with a receptor height of 1.5m above the ground.

14.40 A character correction of +6dB is added to all predicted noise levels to account for the potential tonal character of the noise and obtain a 'rated level'. This correction corresponds to a "highly perceptible" tonal character according to BS 4142, which may be conservative as in many cases, this character may not be so audible, particular in the case of low predicted overall noise levels or fair weather conditions. This character penalty was nevertheless assumed as a worst-case.

Assessment Limitations

14.41 As noted above, no specific measurements of the baseline noise environment were undertaken in most cases, with the exception of Stonebyres to consider noise from existing OHLs (R Route (north)) for the P-G via K and C-K Connections. The construction noise assessment is therefore based on existing day-time ambient noise levels at sensitive receptors being less than 65dB $L_{Aeq,\ 16hour}$, when rounded to the nearest 5dB. In that respect, the assessment will be worst-case in that regard, as increased baseline noise levels could only correspond to less stringent requirements compared to the criteria of **Table 14.5**.

14.42 Details of specific construction activity, plant to be used or exact programme are not available at this stage of the KTR Project. This construction noise assessment assumes typical activity for the type and scale of development and that all plant and equipment used are operated continuously throughout the ten-hour working day and are located at the same distance from the noise sensitive receptor. This is considered unlikely to occur in practice and therefore represents a worst-case scenario.

14.43 Whilst some information gaps have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant construction noise effects associated with ancillary works, tower removal and the operation of the proposed OHLs.

14.44 The assessment of operational noise is based on estimated values for the conductor properties and based on a generic empirical noise model. The conductor heights were estimated on a worst-case basis, therefore providing a robust assessment. Finally, the characteristics and conditions for conductors in the existing OHLs are not known with as much detail and so were evaluated on a qualitative basis.

Future Baseline in the Absence of the Development

14.45 It is considered likely that the future baseline noise levels in the assessment area will not significantly differ from the existing baseline.

Implications for Climate Change

14.46 Qualitatively, the UKCP18[10] projects the following for Dumfries and Galloway:

- an increase in summer and winter temperatures;
- an increase in dry spells, particularly in summer months;
- an increase in winter rainfall; and
- an increase in wind speeds, including an increase in the frequency of winter storms.

14.47 Although increased temperatures, associated with climate change can affect the propagation of sound, this would represent subtle changes which would not affect any of the conclusions of this chapter. Furthermore, although the seasonal prevalence of rainfall may change, the effects associated with periods of rain are considered in themselves rather than in terms of their relative frequency and so there would not be relevant changes associated with a change to the pattern of rainfall which may arise as a result of climate change.

Infrastructure Location Allowance

14.48 An Infrastructure Location Allowance (ILA) of 50m is proposed as described in **Chapter 4**. It is proposed that any works located in such relative proximity to highly noise-sensitive receptors (residential properties) that potential significant effects were identified (**Table 14.32**) are not microsited any closer to the relevant properties if possible. If necessary, this would, however, be reviewed on a case-by-case basis as, in many cases, the effects are unlikely to be significant, due to the assessment being undertaken on a 'worst case' basis.

[9] Empirical expressions for calculating high voltage transmission corona phenomena, Chartier V. *et. al.*, Bonneville Power Administration Technical report number ERJ-77-167 (1983).

[10] UK Climate Projections (2019) [online], available at: http://www.metoffice.gov.uk/research/collaboration/ukcp

Embedded Mitigation Measures

Construction

14.49 The following industry standard/good practice measures are part of the mitigation embedded as part of the KTR Project design, as set out within **Chapter 3** and detailed in **Appendix 5.2: Embedded and Additional Mitigation and Monitoring Measures**. The measures are therefore accounted for in the assessment as embedded mitigation and will be implemented to minimise noise effects of construction wherever practicable to do so:

- All construction activities to be undertaken in accordance with good practice as set out in BS 5228-1.
- A site contact number for local residents will be provided for further information.
- All equipment will be maintained in good working order and will be fitted with appropriate noise control at all times (for example, silencers, mufflers and acoustic hoods).
- All site employees to be advised of the noise sensitive nature of the area and be informed to adopt the quietest work practices, where appropriate.
- Site terrain, material stockpiles and suitable work locations will be used so as to screen work locations and maximise the distance between work activities and receptors.

14.50 Unless otherwise agreed with D&GC, for example due to large separation distance with neighbouring sensitive receptors, the potential noise and vibration effects of blasting operations will be reduced according to the guidance set out in BS 5228-2 and PAN50 Annex D. Specifically:

- Blasting should take place under strictly controlled conditions with the agreement of the relevant authorities, at regular times within the working week, that is, Mondays to Fridays, between the hours of 10.00am and 16.00pm. Blasting on Saturday mornings should be a matter for negotiation between the contractor and D&GC.
- Vibration levels at the nearest sensitive properties are best controlled through onsite testing processes carried out in consultation with D&GC. This site testing-based process would include the use of progressively increased minor charges to gauge ground conditions both in terms of propagation characteristics and the level of charge needed to release the requisite material. The use of onsite monitoring at neighbouring sensitive locations during the course of this preliminary testing can then be used to define upper final charge values that will ensure vibration levels remain within the criteria set out in PAN50 Annex D; and
- Blasting operations shall adhere to good practice as set out in BS 5228 2, and in PAN50, Annex D in order to control air overpressure.

Operation

14.51 SPEN will follow recommendations from the conductor manufacturer/supplier in terms of the handling, transport, installation and maintenance of the OHLs, to minimise surface features that could enhance corona discharge. The experience and practice of SPEN in this respect will be applied to the KTR Project. This will help minimise the production of audible noise from the OHLs.

Polquhanity to Glenlee (via Kendoon)

Existing Conditions

14.52 The work undertaken indicates the general rural character of the Study Area. Background noise levels throughout the area will likely vary according to specific conditions, particularly in relation to natural noise levels such as wind disturbed foliage and watercourse noise, as well as the varying influence of traffic on the road network in some cases. General daytime noise levels are expected to be consistent with relatively quiet conditions in Scotland. Background noise levels in foul weather (typical rainfall conditions) of 30-35dB were estimated earlier in the chapter. This is consistent with the measurements made at one of the properties considered below, Stonebyres, as summarised above.

14.53 **Table 14.8** identifies several relevant representative noise-sensitive locations in the Study Area: this list is not intended to be exhaustive but sufficient to be representative of noise levels typical of those receptors closest to the proposed ancillary works, tower removal and OHL for the P-G via K connection.

Table 14.8 only comprises highly sensitive receptor locations (residential dwellings), no other less-sensitive receptors were identified as relevant in the Study Area. The receptor locations are also illustrated on **Figure 14.1**.

Table 14.8: Representative Noise Receptor Locations for the P-G via K Connection

ID	Location	Nearest Infrastructure	Approximate Shortest Distance (m)
1	High Carminnows	Construction Compound 1	60
		Wayleave (felling)	75
		Access track	85
2	Dalshangan Lodge	Windthrow felling	240
		Access track[*2]	130
		11kV undergrounding	15
		Tower 232 (N)	130
		Tower 231 (N)	250
		Tower 233 (N)	260
3	Karnak	Windthrow felling	180
		Access track[*2]	60
		11kV undergrounding	40
		Tower 233 (N)	130
		Tower 232 (N)	190
4	Polmaddie Farm	Windthrow felling	170
		Access Track[*2]	150
		Tower 236 (N)	170
		Tower 235 (N)	225
5	4, Dalshangan Road (Dundeugh)	Windthrow felling	270
		Access Track[*2]	80
		11kV undergrounding	40
		Tower 236 (N)	70
		Tower 237 (N)	290
6	The Cabin/Deughside	Wayleave (felling)	170
		Windthrow felling	75
		Access Track[*2]	200
		Working Area	260
		11kV undergrounding	40
		Tower 236 (N)	170
		Tower 235 (N)	205
7	Phail Barcris, Dalry	Wayleave (felling)	150
		Access Track	160
		Access Track[*2]	120
		Working Area	190
		11kV undergrounding	200
		Tower 237 (N)	1610
		Tower 236 (N)	270

ID	Location	Nearest Infrastructure	Approximate Shortest Distance (m)
		Tower 238 (N)	270
		Proposed OHL[*1]	190
8	Stonebyres (Kendoon)	Wayleave (felling)	40
		Working Area	155
		Tower 240 (N)	45
		Tower 239 (N)	170
		Tower 0A (R)	75
		Tower 0 (R)	170
		Temporary substation works	(see below)
		Proposed OHL[*1]	30
9	Afric (Kendoon)	Wayleave (felling)	80
		Working Area	230
		Tower 240 (N)	60
		Tower 239 (N)	240
		Tower 0A (R)	20
		Tower 0 (R)	240
10	Kinross (Kendoon)	Wayleave (felling)	90
		Working Area	170
		Tower 240 (N)	80
		Tower 239 (N)	180
		Tower 0A (R)	90
		Tower 0 (R)	170
11	Stroangassel Farm	Wayleave (felling)	220
		Access Track	95
		11kV undergrounding	65
		Working Area	165
		Tower 003 (R)	150
		Proposed OHL[*1]	160
12	Carsfad Cottage	Felling	30
		Access Track	120
		Access Track[*2]	90
		Construction Compound 2	190
		11kV undergrounding	30
		Working Area	120
		Tower 007 (R)	90
		Tower 007A (R)	80
		Tower 007B (R)	90
		Proposed OHL[*1]	130
13	Inverharrow	Felling	150
		Access Track[*2]	70
		11kV undergrounding	40
		Working Area	210
		Tower 011 (R)	100
		Tower 012 (R)	130
		Proposed OHL[*1]	250
14	Barskeoch Mains	Access Track	240
		Access Track[*2]	270
		11kV undergrounding	80
		Tower 017 (R)	270
15	Allangibbon Cottages	Tower 023A (R)	240
16	Staffa	Access Track	290
		11kV undergrounding	15
		Tower 023A (R)	150
		Tower 023B (R)	180
		Proposed OHL[*1]	340
17	Waterside	Access Track	260
		Access Track[*2]	200
		11kV undergrounding	50
		Tower 026 (R)	200
		Tower 025 (R)	270
18	Carville (Glenlee)	Wayleave (felling)	230
		Access Track	180
		11kV undergrounding	30
		Working Area	80
		Tower 028 (R)	210
		Proposed OHL[*1]	115
19	Dunston (Glenlee)	Wayleave (felling)	230
		11kV undergrounding	30
		Access Track	190
		Working Area	90
		Tower 028 (R)	215
20	Navaar (Glenlee)	Proposed OHL[*1]	220

[*1] *Proposed OHL refers to the conductor (nearest infrastructure) for the new proposed lines for each connection of the KTR Project and is relevant to the operational assessment only.*

[*2] *Access track construction required for the removal of existing towers for the N and R (North) routes. Other access tracks in this table refer to those required for the installation of towers along the P-G (via K) connection or associated ancillary works.*

Construction Effects

Predicted Construction Effects

14.54 The construction effects associated with ancillary works for the P-G via K connection of the KTR Project can be separated into direct and indirect effects. Direct effects assessed in this section include; felling and the construction of access tracks, site compounds and working areas for tower removal and installation. For direct effects, the removal of existing towers along the N Route and R Route (north) and

the construction of access tracks, solely for the removal of the existing towers, were considered separately. Indirect (or secondary) effects are associated with felling of areas of forestry that are vulnerable to potential windthrow effects as detailed in **Chapter 5**.

Direct effects (Ancillary Works)

14.55 The following worst-case noise levels individually calculated for key construction activities directly associated with the construction of the P-G via K connection are set out in **Table 14.9**.

Table 14.9: Predicted Worst-Case Noise Levels Associated with Ancillary Works for the P-G via K Connection

Location	Approximate Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$				
	Construct Working Areas	Construct Temporary Site Compound	11kV under-grounding	Felling	Access Tracks Construction
High Carminnows		85m / 76dB		75m / 68dB	85m / 72dB
Dalshangan Lodge			15m / 83dB		
Karnak			40m / 75dB		
4, Dalshangan Road (Dundeugh)			40m / 75dB		
The Cabin/Deughside	260m / 61dB		40m / 75dB	170m / 61dB	
Phail Barcris, Dalry	190m / 64dB		200m / 59dB	150m / 62dB	160m / 66dB
Stonebyres (Kendoon)	155m / 66dB			40m / 75dB	
Afric (Kendoon)	230m / 63dB			80m / 68dB	
Kinross (Kendoon)	170m / 66dB			90m / 67dB	
Stroangassel Farm	165m / 66dB		65m / 70dB	220m / 58dB	95m / 71dB
Carsfad Cottage	120m / 69dB	190m / 64dB	30m / 77dB	30m / 77dB	120m / 69dB
Inverharrow			40m / 75dB	150m / 62 dB	
Barkeoch Mains			80m / 68dB		240m / 62dB
Staffa			15m / 83dB		290m / 60dB
Waterside			50m / 72dB		260m / 61dB
Carville (Glenlee)	80m / 73dB		30m / 77dB	230m / 58dB	180m / 65dB
Dunston (Glenlee)	90m / 72dB		30m / 77dB	230m / 58dB	190m / 64dB

14.56 Comparing the values in **Table 14.9** with the criteria set out previously in **Table 14.5** indicates that, in many cases, as worst-case predicted noise levels do not exceed 65dB L_{Aeq} and the associated duration is unlikely to exceed four weeks, this would correspond to a very low magnitude of effect at most on a high sensitive receptor, and therefore correspond to **none** which is **not significant**. Other activities which are indicating noise levels >65dB L_{Aeq} are considered below in further detail.

14.57 The predicted noise level in **Table 14.9** at High Carminnows for the construction of the temporary Site Compound 1 is calculated using the nearest distance of construction works (85m). However, most of the construction activity will take place between 200m and 300m from the property, corresponding to reduced predicted noise levels of between 60dB and 65dB (L_{Aeq}), corresponding to a low magnitude of effect at most. Work at closer distances (less than 200m) could correspond to a medium magnitude of effect but is unlikely to last for more than a few weeks and so, this would reduce the magnitude of effect to low. Worst-case predicted levels for other construction activities near High Carminnows correspond to a low magnitude of effect at most. Overall, the ancillary activities close to this property correspond to a low magnitude of effect, which is of **minor** significance. However, assuming as a worst-case that construction of the temporary Site Compound 1 was to occur within 200m of High Carminnows and occurs at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**, this would increase the effect magnitude to medium which would result in **moderate** temporary adverse effects, which is **significant**.

14.58 Only the construction of the compound was considered in the above assessment. The use of the temporary Site Compound 1 throughout the rest of the construction programme will be associated with relatively lower noise generation, mainly with traffic movements in and out and office-based work. No concrete batching or other noisy activities are proposed at the compound.

14.59 Works associated with the undergrounding of the existing 11kV OHL, including the associated felling required, are in some cases associated with noise levels of 75-83dB which could correspond to a medium to high effect magnitude. However, given the expected installation rate of more than 150m per team-week, the duration of works in proximity to any of the properties would in practice be of less than 1 week, and similar in nature to road maintenance works. Similarly the extent of felling required (for example near Carsfad Cottage) is very limited and will not extend this duration beyond a week. This corresponds to a low effect magnitude and a **minor** temporary adverse effect, which is **not significant**.

14.60 Felling associated with the 80m wayleave for the new OHL will result in effects of low magnitude at properties adjacent to the Kendoon Substation, such as Stonebyres, Afric and Kinross given the duration of less than four weeks is very likely. Assuming worst-case that felling works within 100m of these receptors and neighbouring properties were to be carried out at weekends, this would increase the effect magnitude to medium. This would correspond to **moderate** temporary adverse effects, which is **significant**.

14.61 Worst-case predicted levels associated with the construction or upgrading of new access tracks 150m or more from residential properties is associated with a very low magnitude of effect at most, given the likely duration of less than four weeks. At closer distances between 70m and 150m, predicted worst-case levels would be associated with a potential low magnitude of effect based on worst-case predictions in **Table 14.9**; however, this type of activity would likely be completed within one week. Furthermore, most of the tracks are oriented away from the sensitive receptors identified, namely Staffa and Phail Barcris, where noise levels reduce rapidly as works move away from the receptors. In some cases, access track construction works could run parallel to residential properties, such as at Stroangassel Farm but the corresponding closest portion of the track for this receptor would be less than 100m long and therefore also likely to be constructed within one week. This corresponds to a low effect magnitude and a **minor** temporary adverse effect, which is **not significant**.

14.62 In all cases for the P-G via K connection, the construction of working areas for tower installation corresponds to noise levels associated with low magnitude effects at most. Furthermore, this activity will be of short duration (less than 1 week). This corresponds to a **minor** temporary adverse effect at most, which is **not significant**.

14.63 The ancillary works at the Kendoon substation will involve construction of a temporary crane pad with a diversion of the existing access road. The duration of these works would in practice be of less than 1 week, and similar in nature to road maintenance works. This corresponds to a low effect magnitude and a **minor** temporary adverse effect, which is **not significant**.

14.64 In addition to considering each of the activities of **Table 14.9** in isolation, consideration is given to the potential for noise from the different activities in combination which can lead to increased effects. Receptors with the potential for combined activities to lead to effects of low magnitude include; Phail Barcris, Afric, Kinross, Stroangassel Farm, Carville, Dunston and Carsfad Cottage. Combined effects that have the potential to result in medium magnitude effects include Stonebyres and High Carminnows, however in these cases, the activities considered are unlikely to occur simultaneously: felling will be required prior to construction of access tracks and tower working areas, and construction of the compound itself at High Carminnows would follow. The 11kV undergrounding work would likely be undertaken following construction of the access tracks and would remain of very short duration. Furthermore, the combined duration of works is unlikely to exceed four weeks in a year. Therefore, combination effects would not increase the effect assessment set out above.

14.65 As the proposed quarry area for the P-G via K connection (Barlae Hill Quarry) is more than 1km away from the nearest residential property identified, and therefore outside of the Study Area. There are no noise effects associated with noise from stone quarrying operations, and therefore correspond to **none** which is **not significant**. Blasting effects are similarly not expected to be significant but are difficult to predict (as outlined in the method section) and so best managed through onsite management procedures described as part of the embedded measures.

Indirect effects

14.66 The following worst-case noise levels calculated for felling of windthrow areas associated with the P-G via K connection of the KTR Project are set out in **Table 14.10**.

Table 14.10: Predicted Worst-Case Construction Noise Levels for Felling of Windthrow Areas for the P-G via K Connection

Location	Approximate Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$
Dalshangan Lodge	240m / 59dB
Karnak	180m / 62dB
Polmaddie Farm	170m / 62dB
4, Dalshangan Road (Dundeugh)	270m / 58dB
The Cabin/Deughside	75m / 69dB

14.67 For most of the properties listed in **Table 14.10**, felling associated with the areas proposed to be felled due to windthrow risk is greater than 100m from receptors and therefore associated with noise levels of less than 62dB L_{Aeq} and the associated duration is unlikely to exceed four weeks, corresponding to a very low magnitude of effect. At closer distances (less than 100m), such as at The Cabin and Deughside, noise levels have the potential to be associated with low magnitude of effect. However, noise level predictions in **Table 14.10** correspond to the closest distance, whereas a large majority of the felling will take place greater than 100m from the receptor locations. Of an approximate 27 hectare (ha) area due to be felled, only 0.2ha will require felling within 100m of the two receptors. Therefore, based on likely felling rates, the duration of any work in closer proximity to the properties identified will be very limited in extent (likely less than one week) which therefore also results in the associated magnitude of effect on highly sensitive receptors as being very low. This would therefore correspond to **none** which is **not significant**.

Direct effects (N and R Route Tower Removal)

14.68 The following worst-case noise levels calculated for tower removal and track construction required to access existing towers, directly associated with the P-G via K connection of the KTR Project are set out in **Table 14.11**.

Table 14.11: Predicted Worst-Case Noise Levels Associated with N and R Route Tower Removal for the P-G via K Connection

ID	Location	Approximate Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$	
		Tower Removal	Access Track Construction
2	Dalshangan Lodge	130m / 62dB	130m / 68dB
		250m / 56dB	
		260m / 55dB	
3	Karnak	130m / 62dB	60m / 76dB
		190m / 58dB	
4	Polmaddie Farm	225m / 57dB	150m / 67dB
		170m / 60dB	
5	4, Dalshangan Road (Dundeugh)	70m / 68dB	50m / 77dB
		290m / 54 dB	
6	The Cabin/Deughside	170m / 60dB	200m / 64dB
		205m / 58dB	
7	Phail Barcris, Dalry	110m / 64dB	120m / 69dB
8	Stonebyres (Kendoon)	45m / 72dB	
		170m / 60dB	
		75m / 67dB	
		170m / 60dB	
9	Afric (Kendoon)	20m / 80dB	
		60m / 70dB	
		240m / 56dB	
		240m / 56dB	
10	Kinross (Kendoon)	80m / 67dB	
		90m / 66dB	
		180m / 59dB	
		170m / 60dB	
11	Stroangassel Farm	150m / 61dB	
12	Carsfad Cottage	80m / 67dB	90m / 72dB
		90m / 66dB	
		80m / 67dB	
13	Inverharrow	100m / 65dB	100m / 69dB
		130m / 62dB	
14	Barkeoch Mains	270m / 55dB	270m / 61dB
15	Allangibbon Cottages	250m / 56dB	
16	Staffa	150m / 61dB	
		180m / 59dB	
17	Waterside	200m / 58dB	200m / 64dB
		270m / 55dB	
18	Carville (Glenlee)	210m / 58dB	
19	Dunston (Glenlee)	215m / 57dB	

14.69 Most of the residential properties in **Table 14.11** are over 100m from existing towers and their removal has as a result predicted worst-case noise levels of 65dB L_{Aeq} or less and the associated duration is unlikely to exceed four weeks, this would correspond to a very low magnitude of effect at most on a high sensitive receptor, and therefore correspond to **none** which is **not significant**.

14.70 For properties less than 100m from existing towers, namely properties along Dalshangan Road, Stonebyres, Afric, Kinross (and their neighbouring receptors around the Kendoon Substation) and Carsfad Cottage, predicted worst-case noise levels correspond to a potential low magnitude of effect at most for the removal of towers for these receptors, with the exception of Afric (see below). Furthermore, noise-generating tower removal works are likely to be completed within less than one week[11] before removal works progress to the next tower, moving further away from noise-sensitive locations, quickly diminishing the noise level further. This corresponds to a **minor** temporary adverse effect at most, which is **not significant**.

14.71 With the exception of Stroangassel Farm, Barkeoch Mains, Allangibbon Cottages, Carville and Dunston, most of the receptors in **Table 14.11** have multiple towers proposed for removal located within the

[11] Although **Chapter 5** estimates a total period of 10 days per tower for removal works, the main noise-generating activities (tower and concrete foundation removal) is estimated to take 2 days.

300m Study Area around the properties. In all cases excluding Afric, noise levels associated with the concurrent removal of towers surrounding each receptor correspond to a low magnitude of effect at most. Furthermore, concurrent noisy work associated with tower removal is unlikely given the sequencing of the work described in **Chapter 5**. There are therefore no additional effects due to combination of works.

14.72 The worst-case predicted noise level for the removal of tower 0A(R) at Afric has the potential to be associated with a medium magnitude of effect. Although the noise-generating part of the works is short as discussed above, the property is surrounded by two towers proposed for removal (within 100m) which will increase the duration of exposure to almost one week. As a worst-case, some of this work could occur at weekends, including Saturday afternoon and Sundays based on the working hours set out in **Chapter 5.** Given this and the predicted worst-case noise levels, it is considered based on professional judgment that this could represent an effect of medium magnitude at this property, despite the short duration of the work. This would represent a **moderate** temporary adverse effect which is **significant**.

14.73 Worst-case predicted levels associated with the construction or upgrading of new access tracks 150m or more from residential properties is associated with a very low magnitude of effect at most, given the likely duration of less than four weeks. At distances less than 150m, predicted worst-case levels would be associated with a potential low to medium magnitude of effect based on worst-case predictions in **Table 14.11**; however, most new tracks constructed for existing tower removal are less than 100m in length and likely be completed within one week. Furthermore, most of the tracks are oriented away from the sensitive receptors identified, where noise levels reduce rapidly as works move away from the receptors. Where access tracks are proposed in relative proximity (less than 40m at the closest point) and run parallel to a property associated with (north) removal (in this case for Karnak), the corresponding closest section of the track would be less than 100m long and therefore also likely to be constructed within one week. However, given the associated predicted worst-case levels of **Table 14.11** at Karnak and that, as a worst-case this could occur at weekends, including Saturday afternoon and Sundays based on the working hours set out in **Chapter 5**, it is considered, based on professional judgment, that this could represent an impact of medium magnitude in this instance despite the short duration of the work. This would represent a **moderate** temporary adverse effect which is **significant**.

14.74 Finally, the potential for the construction activities associated with the tower removal works (**Table 14.11**) to combine with other construction activities for the P-G via K connection (**Table 14.9**) is considered. This is generally unlikely to occur as the removal of the N and R Routes will largely occur after the construction of the proposed line has been completed. Some ancillary work such as access track construction may however be undertaken over the same period. But when considering the duration and noise levels associated with the works for these properties, and given the assessment above has been undertaken on a worst-case basis for the construction activities occurring in closest proximity of each of the properties considered in each case, combination effects are not increased compared to the above assessment.

Additional Mitigation

14.75 Noise-generating works associated with the construction of the temporary Site Compound 1 within 200m of High Carminnows, felling within 100m of properties adjacent to the Kendoon Substation, tower removal within 100m of Afric and access track construction within 150m of Karnak will be limited during weekends to the hours 08:00 to 13:00 on Saturdays, with no work on Sundays. Activities that are unlikely to give rise to noise audible at sensitive receptors may continue outside of the stated hours.

14.76 These location/activity specific restrictions on working hours, in addition to the embedded mitigation measures, are considered likely to be formally documented with D&GC either by way of planning conditions or as part of an agreement under Section 61 of the Control of Pollution Act 1974 for prior consent of works.

Residual Construction Effects

14.77 The proposed additional mitigation measures will further reduce the significant construction direct and indirect noise effects, such that their magnitude is low in all cases for all high sensitivity noise receptors. Based on **Table 14.6**, this corresponds to a **minor** temporary adverse effect at most, which is **not significant**. Some of the other activities, more distant from neighbouring sensitive receptors or of very limited extent will have no adverse effects, corresponding to **none**.

Operational Effects

Predicted Operational Effects

14.78 Worst-case noise rating levels calculated for foul and fair weather conditions along the proposed P-G via K connection of the KTR Project are set out in **Table 14.12.**

Table 14.12: Predicted Worst-Case Operational Noise Rating Levels for the P-G via K Connection

Location	Approximate Shortest Horizontal Separating Distance (m)	Predicted Noise Rating Level (dB, $L_{Ar,Tr}$)	
		Foul Weather	Fair Weather
Phail Barcris, Dalry	190	5	-20
Stonebyres (Kendoon)	30	15	-10
Stroangassel Farm	160	6	-19
Carsfad Cottage	130	7	-18
Inverharrow	250	4	-22
Staffa	340	2	-23
Carville (Glenlee)	115	7	-18
Navaar (Glenlee)	220	4	-21

14.79 The predicted rated levels of **Table 14.12** for foul weather conditions do not exceed 15dB(A) for all receptor locations and therefore likely to be below existing typical background noise levels in the area at the locations considered during rainy conditions. At Stonebyres specifically, the predicted rated levels are more than 10dB below the typical lowest background noise levels measured. Based on the guidance of BS 4142, this corresponds to a very low magnitude of effect on a highly sensitive receptor. In fair weather conditions, predicted levels are negative which means they would be below the typical hearing threshold. This would correspond to **none**, which is **not significant** in EIA terms under both weather conditions.

14.80 As the existing N and R connections would not operate at the same time as the proposed P-G via K connection outside of a potential short-term commissioning period, there would not be any substantial combined operational effect between the existing and proposed lines.

14.81 Furthermore, the Stonebyres location is currently located in proximity to an existing OHL comprising the existing N Route which would be replaced as part of the P-G via K Connection. The relevant existing OHL (between 239(N) and 240(N)) is located north of the property and appears to be broadly similar to the proposed replacement OHL in terms of the number and arrangements of the conductors but is located slightly closer to the property (see **Figure 4.8a**). Furthermore, the existing lines are likely to produce relatively greater noise levels as they are weathered, which is more likely to create corona discharge during foul weather conditions: therefore, the replacement of weathered conductors for new will represent a medium-term reduction in noise-levels associated with the corona discharge (until the new lines become weathered in turn).

14.82 Therefore, compared to the baseline situation, the proposed OHL is likely to be associated with a marginal decrease (in the medium term) in operational noise associated with corona discharge during foul weather. As the associated magnitude of effects are so low (see above) this would still correspond **none** for this property.

Additional Mitigation

14.83 No specific additional mitigation measures are required.

Residual Operational Effects

14.84 There are **no significant** effects from operational noise for the P-G via K Connection.

Cumulative Effects

14.85 The potential for cumulative effects associated with P-G via K in combination with the other connections which comprise the KTR Project and other developments is assessed below.

14.86 Construction noise effects are localised in nature. Considering the location and the likely phasing of the proposed works (see **Chapter 5**), there is the potential for the proposed works to generate combined effects with the proposed BG Deviation, G-T and E-G connections. Considering the location and the likely phasing of the proposed works (see **Chapter 5**), there would be no significant cumulative inter-connection construction noise effects for the C-K connection (receptors for cumulative operational noise are considered below). In relation to the proposed Glenlee Substation Extension, this would be completed prior to the start of the P-G via K connection works. Therefore the Glenlee Substation Extension Project would not contribute to cumulative effects with the P-G via K connection.

14.87 Specifically, as set out in **Tables 14.29** and **14.30**, Waterside, Staffa, Carville and Dunston are the only representative receptors identified where potential ancillary works from other connections may combine with the P-G via K connection. The assessment presented after **Table 14.30** demonstrates that for some of these properties there are no additional significant effects.

14.88 However, for properties at Glenlee (such as Carville and Dunston) there is the potential, if the noisiest works within 100m of these properties for the P-G via K, E-G and G-T connections run concurrently, that significant effects could occur. Without mitigation, worst-case effects of medium magnitude on highly sensitive receptors at Glenlee would represent **moderate** temporary adverse effects which are **significan**t. Additional mitigation is therefore proposed, see KTR Project as a Whole assessment, to prevent the works identified occurring concurrently, to avoid the potential for combined excessive noise levels.

14.89 The residual cumulative effect magnitude would become low after the additional mitigation has been applied which would represent **minor** effects which are **not significant**.

14.90 As set out in **Table 14.29**, there is also the potential for cumulative increases in operational noise due to contributions from the the C-K ,E-G, G-T connections and BG deviation. The Glenlee Substation Extension Project did not include new sources of operational noise so this aspect was scoped out. The relevant predictions are set out in **Table 14.31**, for receptors including Stonebyres (Kendoon), Stroangassel Farm, Carsfad Cottage, Staffa, Navaar, Carville and Dunston (representative of properties surrounding the Glenlee Substation). The predictions show that cumulative operational noise levels are dominated by noise associated with the C-K, E-G or G-T connections, and therefore the conclusions at these properties are similar to those reached for these connections in isolation (as set out in the following sections), and corresponding to **none,** which is **not significant**.

Monitoring

14.91 No specific monitoring measures are considered to be required during construction or operation of the P-G via K connection.

Summary of Effects

14.92 Works associated with direct and indirect ancillary construction works for the P-G via K connection of the KTR Project have **minor** temporary adverse effect at most following mitigation, which is considered **not significant** in EIA terms.

14.93 There are **no adverse significant** effects from operational noise from the proposed OHL for the P-G via K connection.

14.94 There are **no significant** residual cumulative effects due to the influence of the other proposed connections of the KTR Project or other proposed developments in the area.

Carsfad to Kendoon

Existing Conditions

14.95 The desktop work undertaken indicates the general rural character of the Study Area. Background noise levels throughout the area will likely vary according to specific conditions, particularly in relation to natural noise levels such as wind disturbed foliage and watercourse noise, as well as the varying influence of traffic on the road network in some cases. General daytime noise levels are expected to be consistent with relatively quiet conditions for Scotland. Background noise levels in foul weather (typical rainfall conditions) of 30-35 dB(A) were estimated earlier in the chapter. This is consistent with the measurements made at one of the specific properties considered below, Stonebyres, as summarised above.

14.96 **Table 14.13** identifies several relevant representative noise-sensitive locations identified in the Study Area: this list is not intended to be exhaustive but sufficient to be representative of noise levels typical of those receptors closest to the proposed ancillary work and transmission line for the C-K connection. **Table 14.13** only comprises highly sensitive receptor locations (residential dwellings), no other less-sensitive receptors were identified as relevant in the Study Area. The receptor locations are also illustrated on **Figure 14.1**.

Table 14.13: Representative Noise Receptor Locations for the C-K Connection

ID	Location	Nearest Infrastructure	Approximate Shortest Distance (m)
8	Stonebyres (Kendoon)	Wayleave (felling)	40
		Working Area	120
		Proposed OHL*	Overhead
9	Afric	Wayleave (felling)	90
		Working Area	190
10	Kinross (Kendoon)	Wayleave (felling)	20
		Working Area	120
11	Stroangassel Farm	Wayleave (felling)	200
		Access Track	140
		Working Area	110
		Proposed OHL*	125
12	Carsfad Cottage	Wayleave (felling)	40
		Access Track	90
		Working Area	70
		Proposed OHL*	100

** Proposed OHL refers to the conductor (nearest infrastructure) for the new proposed lines for each connection of the KTR Project and is relevant to the operational assessment only*

Construction Effects

Predicted Construction Effects

14.97 The construction effects associated with the C-K connection of the KTR Project only comprise direct effects: felling for the 70m wayleave, the construction of access tracks and the construction of working areas (for wooden pole installation).

14.98 The proposed works at the Carsfad substation include minor modification to the switchgear and modification to the fencing which will involve effectively negligible noise emissions for a short period of time, in addition to installation of a new gantry (which is scoped out): these effects are not assessed further.

Direct effects

14.99 The following worst-case noise levels calculated for key construction activities directly associated with ancillary works for the C-K connection of the KTR Project are set out in **Table 14.14**. In the present case, use of matting only is proposed for the construction access tracks, rather than the more noise-generating upgrading and levelling work for other types of tracks considered in this chapter; there would therefore only be limited associated noise effects, and this is not considered further in this section.

Table 14.14: Predicted Worst-Case Construction Noise Levels the C-K Connection

Location	Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$	
	Forestry Felling	Construct Working Areas
Stonebyres (Kendoon)	40m / 75dB	120m / 69dB
Afric	90m / 72dB	190m / 64dB
Kinross	20m / 81dB	120m / 69dB
Stroangassel Farm	200m / 59dB	110m / 70dB
Carsfad Cottage	40m / 75dB	70m / 74dB

14.100 Comparing the values in **Table 14.14** with the criteria set out previously in **Table 14.5** indicates that for ancillary activities that take place greater than 150m from sensitive receptors, as worst-case predicted noise levels do not exceed 65dB L_{Aeq}, this would correspond to a very low magnitude of effect on high sensitive receptors and corresponds to **none**, which is considered **not significant**. Felling and wood pole working areas within closer distances are considered further below.

14.101 Felling associated with the 70m wayleave for the new OHL is associated with potential effects of medium magnitude for properties surrounding the Kendoon Substation and Carsfad Cottage (properties within 100m of felling activity). However, the predictions of **Table 14.14** assume sound emission levels of 115dB L_{wA} (**Table 14.7**) whereas for example individual activities would have lower noise emissions: for example, use of a chainsaw corresponds to emission levels closer to 109dB L_{wA}, meaning that lower levels would be experienced in practice for the majority of the time. Additionally, the area of felling works proposed in proximity to representative properties Afric and Stonebyres is less than 0.1ha in total and is therefore likely to be completed within one week, corresponding to **none** and therefore **not significan**t.

14.102 The predicted noise levels in **Table 14.14** are calculated using the nearest distance of felling (20m) from Kinross and 40m from Carsfad Cottage or Stonebyres, whereas most felling activity will take place greater than 70m away from Kinross, and between 60m and 120m from Carsfad Cottage or Stonebyres, corresponding to reduced predicted noise levels less than 71dB L_{Aeq} for both properties at most, associated with a low magnitude of effect. Assuming as a worst-case that felling within 100m of Carsfad Cottage, Stonebyres or Kinross occurs at weekends, including Saturday afternoon and Sundays, based on the working hours set out in **Chapter 5**: this would increase the effect magnitude to medium which would result in **moderate** temporary adverse effects, which is **significant**.

14.103 For all receptors considered in the C-K Connection, the construction of working areas for wood pole erection corresponds to noise levels associated with low magnitude effects at most. Furthermore, this activity will be of short duration (less than one week). This corresponds to a **minor** temporary adverse effect at most, which is **not significant**.

14.104 In addition to considering each of the activities of **Table 14.14** in isolation, consideration is given to the potential for noise from the different activities in combination which can lead to increased effects. If the activities considered were to run concurrently, this could represent a marginal increase of less than 1dB at Stonebyres, and less than 3dB at Carsfad Cottage (which would be unlikely given the short duration of the works considered). However, in these cases, if the activities run concurrently, the works would likely be completed within one week. Alternatively, in the case where the activities run consecutively, works are unlikely to exceed four weeks in a year at these locations and worst-case levels would not exceed 75dB L_{Aeq}: this would correspond to a low effect magnitude (with the exception of weekend work as discussed above). At other properties, simultaneous working would result in negligible increases, and sequential work also result in negligible increases in exposure duration. In summary, combination effects would not increase the effect assessment set out above.

14.105 Having considered the activities of **Table 14.14** individually, there would be no additional effects due to their combination given the relative noise levels predicted.

Additional Mitigation

14.106 Noise-generating works associated with felling within 100m of Carsfad Cottage, Stonebyres or Kinross will be limited during weekends to the hours 08:00 to 13:00 on Saturdays, with no work on Sundays. Activities that are unlikely to give rise to noise audible at sensitive receptors may continue outside of the stated hours.

14.107 These location/activity specific restrictions on working hours, in addition to the embedded mitigation measures, are considered likely to be formally documented with D&GC either by way of planning conditions or as part of an agreement under Section 61 of the Control of Pollution Act 1974 for prior consent of works.

Residual Construction Effects

14.108 The proposed additional mitigation measures will further reduce direct construction effects, such that their magnitude is low in all cases for all high sensitivity noise receptors. Based on **Table 14.6**, this corresponds to a **minor** temporary adverse effect at most, which is **not significant**. Some of the other activities, more distant from neighbouring sensitive receptors or of very limited extent, will have **no** adverse effects.

Operational Effects

Predicted Operational Effects

14.109 The following worst-case noise rating levels have been calculated for foul and fair weather conditions along the proposed C-K connection of the KTR Project as set out in **Table 14.15.**

Table 14.15: Predicted Worst-Case Operational Noise Rating Levels for the C-K Connection

Location	Approximate Shortest Horizontal Separating Distance (m)	Predicted Noise Rating Level (dB, $L_{Ar, Tr}$)	
		Foul Weather	Fair Weather
Stonebyres	Overhead	39	14
Stroangassel Farm	125	25	0
Carsfad Cottage	75	28	3

14.110 Other than at Stonebyres, the predicted rated levels of **Table 14.15** for foul weather conditions are less than 30dB(A) and therefore comparable to likely background noise levels during rainy conditions. Based on the guidance of BS 4142 this corresponds to a low impact at most on highly sensitive receptors. Predicted levels in fair weather are also close to the hearing threshold at these properties and therefore low in absolute terms. This would correspond to **none**, which is **not significant** in EIA terms under both weather conditions.

14.111 Higher operational rated noise levels of 39dB(A) are predicted in foul weather at Stonebyres (representative as a worst-case example of properties surrounding the Kendoon Substation) as the proposed OHL passes immediately above the property. However, the OHL of the existing R Route (north) (between the 0(R) and 0A(R) towers) is located above the Stonebyres property at a similar distance as the proposed new OHL which would be connected to the Kendoon substation. It is therefore more relevant to consider the potential change in operational noise associated with the replacement of the existing OHL (R route (north)) with the proposed C-K Connection.

14.112 The baseline measurements undertaken at Stonebyres and detailed in **Appendix 14.1** determined that levels of around 30 to 35dB L_{Aeq} likely associated with the existing OHL were measured during foul weather periods. Considering the tonal nature of the noise, with a penalty of +6 dB this represents rated levels of 36dB(A) to 41dB(A) which are similar to those predicted in **Table 14.15** above. These levels are similar, *i.e.* within 3dB, of the predicted noise levels: as explained above, this difference would be difficult to discern in practice and therefore correspond to a very low magnitude of effect.

14.113 The noise emissions from the existing OHL are likely to be marginally higher than those of the proposed C-K Connection line, given their age, meaning they are more likely to be weathered and therefore create corona discharge during foul weather conditions. Both OHLs have the same number of conductor lines with a comparable arrangement (even though the structure type is different (steel tower to wood pole). Therefore, the predictions of **Table 14.15** are considered conservative and, compared to the baseline situation, the proposed OHL is likely in practice to be associated with a marginal decrease in the medium term in operational noise associated with corona discharge during foul weather (until the new OHL becomes weathered in turn).

14.114 The measurements also highlighted that elevated background levels of between 47 and 57dB L_{A90} can be experienced at the property, due to increased water flow in the Water of Ken related to operation of the nearby Hydro power station: this would likely mask the noise from the OHL during these periods.

14.115 The physical decommissioning of the existing R Route (north) towers is not proposed as part of the C-K Connection. But the existing R route (north) connection would not operate at the same time as the proposed C-K Connection outside of a short commissioning period: there would therefore not be any substantial combined operational effect between existing and proposed lines, and the proposed connection would likely correspond to a medium-term reduction in operational noise compared to the baseline situation.

14.116 Taking into account the above factors, although there is a potential for a minor beneficial effect in the medium term from a potential decrease in operational noise associated with replacing the older OHL with a newer connection on wood poles, as worst-case (and in the longer-term) there would be similar noise levels corresponding to a very low magnitude of effect at most on a highly sensitive receptor, and therefore correspond to **no effect** which is **not significant**.

Additional Mitigation

14.117 No specific additional mitigation measures are required.

Residual Operational Effects

14.118 In summary, there are **no significant** adverse effects from operational noise for the C-K Connection.

Cumulative Effects

14.119 The potential for cumulative effects associated with the C-K Connection in combination with the other connections which comprise the KTR Project is assessed below. Other developments including the Glenlee Substation Extension Project are located relatively far away from the C-K Connection such that no cumulative effects would occur.

14.120 Construction noise effects are localised in nature. Considering the location and the likely phasing of the proposed works (see **Chapter 5**), there would be **no significant** cumulative inter-connection construction noise effects for the C-K Connection.

14.121 As set out in Table 14.29, there is the potential for cumulative increases in operational noise due to contributions from the the C-K and P-G (via K) connections. The relevant predictions are set out in **Table 14.31**, for receptors including Stonebyres (Kendoon), Stroangassel Farm and Carsfad Cottage. The predictions show that cumulative operational noise levels at these properties are dominated by noise associated with the C-K Connection and therefore the conclusions at these properties are similar to those reached for this connection in isolation (as set out in the section above), corresponding to **none,** which is **not significant**.

Monitoring

14.122 No specific monitoring measures are considered to be required during construction of operation of the C-K connection.

Summary of Effects

14.123 Works associated with direct ancillary works for the Carsfad to Kendoon connection of the KTR Project have **minor** temporary adverse effect at most following additional mitigation, which is considered **not significant** in EIA terms**.**

14.124 There are **no significant** effects from operational noise from the proposed C-K Connection.

14.125 There are **no significant** cumulative effects due to the influence of the other proposed connections of the KTR Project or other proposed developments in the area.

Earlstoun to Glenlee

Existing Conditions

14.126 The desktop work undertaken indicates the general rural character of the Study Area. Background noise levels throughout the area will likely vary according to specific conditions, particularly in relation to natural noise levels such as wind disturbed foliage and watercourse noise, as well as the varying influence of traffic on the road network in some cases. General daytime noise levels are expected to be consistent with relatively quiet conditions for Scotland. Background noise levels in foul weather (typical rainfall conditions) of 30-35dB(A) were estimated earlier in the chapter.

14.127 **Table 14.16** identifies relevant representative noise-sensitive locations identified in the Study Area: this list is not intended to be exhaustive but sufficient to be representative of noise levels typical of those receptors closest to the proposed ancillary works and transmission line for the E-G connection. **Table 14.16** only comprises highly sensitive receptor locations (residential dwellings), no other less-sensitive receptors were identified as relevant in the Study Area. The receptor locations are also illustrated on **Figure 14.1**.

Table 14.16: Representative Noise Receptor Location for E-G Connection

ID	Location	Nearest Infrastructure	Approximate Shortest Distance (m)
15	Allangibbon Cottages	Proposed OHL	240
16	Staffa	Wayleave (felling)	120
		Access Track	70
		Working Area	170
		Proposed OHL	140
17	Waterside	Wayleave (felling)	160
		Windthrow Felling	170
		Access Track	155
		Working Area	150
		Proposed OHL	195
18	Carville (Glenlee)	Underground cabling to substation	30
		Wayleave (felling)	80
		Access Track	80
		Working Area	80
		Proposed OHL	120
19	Dunston (Glenlee)	Underground cabling to substation	40
		Wayleave (felling)	90
		Access Track	90
		Working Area	90

Construction Effects

Predicted Construction Effects

14.128 The construction effects associated with the E-G Connection can be separated into direct and indirect effects. Direct effects assessed in this section include; felling, the construction of access tracks, the construction of working areas (for wooden pole installation) and the laying of a short section of underground cable into the Glenlee Substation. Indirect effects are associated with an area of felling of forestry that is vulnerable to potential windthrow effects as detailed in **Chapter 5**.

14.129 The proposed works at the Earlstoun substation include minor modification to the switchgear which will involve effectively negligible noise emissions for a short period of time, in addition to tower erection (which was scoped out): these effects are not assessed further.

Direct effects

14.130 The following worst-case noise levels calculated for key construction activities directly associated with ancillary works for the E-G connection of the KTR Project are set out in **Table 14.17**. In the present case, use of matting only is proposed for the construction access tracks, rather than the more noise-generating upgrading and levelling work for other types of tracks considered in this chapter; there would therefore only be limited associated noise effects, and this is not considered further in this section.

Table 14.17: Predicted Worst-Case Construction Noise Levels for Direct Ancillary Development of the E-G Connection of the KTR Project

Location	Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$		
	Forestry Felling	Laying of Underground Cable	Construct Working Areas
Staffa	120m / 64dB		170m / 66dB
Waterside	160m / 61dB		150m / 67dB
Carville (Glenlee)	80m / 68dB	30m / 77dB	80m / 73dB
Dunston (Glenlee)	90m / 67dB	40m / 75dB	90m / 72dB

14.131 **Table 14.17** shows that excavation works related to laying the underground cable to the Glenlee Substation will vary between distances of 30m to 100m from the nearest residential properties (Carville and Dunston, representative of properties around the Glenlee Substation). This would correspond to a range of predicted noise levels of between 66dB and 77dB (L_{Aeq}). Predicted noise levels associated with cable installation within 40m of nearest sensitive receptors (75dB to 77dB) are likely to be completed within one week, with total installation works likely completed within two weeks. Most of this work would correspond to levels below 75dB L_{Aeq}, and therefore, based on the criteria set out previously in **Table 14.5**, correspond to low effects. Overall, the ancillary activities close to these properties correspond to a low magnitude of effect, which is of **minor** significance. However, assuming as a worst-case that these works occur at weekends, including Saturday and Sunday afternoons, based on the working hours set out in **Chapter 5**: this would increase the effect magnitude to medium on a high sensitive receptor, which would result in **moderate** temporary adverse effects, which is **significant**.

14.132 Felling associated with the 70m wayleave for the new OHL within 100m of properties is associated with potential effects of low magnitude, at most, for properties surrounding the Glenlee Substation (represented by Carville and Dunston). However, the predicted noise levels in **Table 14.17** are calculated using the nearest distance of felling, whereas most felling activity will take place greater than 100m away from both properties, corresponding to reduced predicted noise levels less than 66dB L_{Aeq} at most, associated with a very low to low magnitude of effect. Assuming as a worst-case that felling within 100m of Carville and Dunston occurs at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**: this would increase the effect magnitude to medium which would result in **moderate** temporary adverse effects, which is **significant.**

14.133 For all receptors considered in the E-G connection, the construction of working areas for wood pole erection corresponds to noise levels associated with low magnitude effects at most. Furthermore, this activity will be of short duration (less than one week). This corresponds to a **minor** temporary adverse effect at most, which is **not significant**.

14.134 In addition to considering each activity in isolation, all properties considered have the potential to be affected by a combination of these ancillary activities. However, at Staffa or Waterside, combined worst-case noise levels would not exceed 75dB L_{Aeq} and the combined duration of works at all locations is unlikely to exceed four weeks in a year. At Carville and Dunston, although combined worst-case noise levels of up to 79dB may occur in theory, this would be for very short periods in which the works occurring at the closest distances happened at the same time. In the scenario in which multiple ancillary works do not occur concurrently leading to longer exposure periods, combination effects above 75dB for more than one week remain unlikely. This would not alter the above conclusion of **moderate significant** adverse effects based on a worst-case assumption of weekend work. Therefore, combination effects would not increase the effect assessment set out above.

Indirect effects

14.135 The following worst-case noise level calculated for felling of the windthrow area associated with the E-G connection is set out in **Table 14.18**.

Table 14.18: Predicted Worst-Case Construction Noise Levels for Felling of Windthrow Area for the E-G Connection

Location	Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$
Waterside	170m / 62dB

14.136 Felling associated with windthrow areas at Waterside is likely to be completed within two weeks and is at a distance from the receptor such that likely effects will be of very low magnitude, which corresponds to **none** and is **not significant.**

Additional Mitigation

14.137 Noise-generating works associated with the laying of underground cable to the Glenlee Substation within 100m of properties (such as Carville and Dunston) will be limited during weekends to the hours 08:00 to 13:00 on Saturdays, with no work on Sundays. Activities that are unlikely to give rise to noise audible at sensitive receptors may continue outside of the stated hours.

14.138 These location/activity specific restrictions on working hours, in addition to the embedded mitigation measures, are considered likely to be formally documented with D&GC either by way of planning conditions or as part of an agreement under Section 61 of the Control of Pollution Act 1974 for prior consent of works.

Residual Construction Effects

14.139 The proposed additional mitigation measures will further reduce direct construction effects, such that their magnitude is at most low in all cases for all high sensitivity noise receptors. Based on **Table 14.5**, this corresponds to a **minor** temporary adverse effect, which is **not significant**. Some of the other activities more distant from neighbouring sensitive receptors or of very limited extent, will have **no** adverse effects.

Operational Effects

Predicted Operational Effects

14.140 Worst-case noise levels have been calculated for foul and fair weather conditions along the proposed E-G connection as set out in **Table 14.19.**

Table 14.19: Predicted Worst-Case Operational Noise Rating Levels for the E-G Connection

Location	Approximate Shortest Horizontal Separating Distance (m)	Predicted Noise Rating Level (dB, $L_{Ar, Tr}$)	
		Foul Weather	Fair Weather
Allangibbon Cottages	240	22	-3
Staffa	140	25	0
Waterside	195	23	-2
Carville (Glenlee)	120	26	1

14.141 The predicted rated levels of **Table 14.19** for foul weather conditions are less than 30dB(A) and therefore likely below corresponding existing typical background noise levels in the area during rainy conditions at the locations considered. Based on the guidance of BS 4142, this corresponds to a very low magnitude of effect on a highly sensitive receptor. In fair weather conditions, predicted levels are negative which means they would be below the typical hearing threshold. This would correspond to **none**, which is **not significant** in EIA terms under both weather conditions.

14.142 As the existing R (north) connection would not operate at the same time as the proposed E-G connection outside of a short commissioning period, there would not be any substantial combined operational effect between existing and proposed lines.

Additional Mitigation

14.143 No specific additional mitigation measures are required.

Residual Operational Effects

14.144 In summary, there are **no significant** adverse effects from operational noise for the proposed E-G connection.

Cumulative Effects

14.145 The potential for cumulative effects associated with the E-G Connection in combination with the other connections which comprise the KTR Project and other developments is assessed below.

14.146 Construction noise effects are localised in nature. Considering the location and the likely phasing of the proposed works (see **Chapter 5**), there is the potential for the proposed works to generate combined effects with the proposed P-G via K and G-T connections and BG Deviation. In relation to the proposed Glenlee Substation Extension, this would be completed prior to the start of the E-G connection works. Therefore the Glenlee Substation Extension Project would not contribute to cumulative effects with the E-G Connection.

14.147 Specifically, as set out in **Tables 14.29** and **14.30**, Waterside, Carville and Dunston are the only representative receptors identified where potential ancillary works from other connections may combine with the E-G Connection. The assessment presented after **Table 14.30** demonstrates that, for some of the properties, there are no additional significant effects due to cumulative increases in level or duration of noise exposure associated with multiple connections in combination.

14.148 However, for properties at Glenlee (such as Carville and Dunston) there is the potential, if the noisiest works within 100m of these properties for the P-G via K, E-G and G-T connections run concurrently, that significant effects could occur. Without mitigation, worst-case effects of medium magnitude on highly sensitive receptors at Glenlee would represent **moderate** temporary adverse effects which are **significant**. Additional mitigation is therefore proposed, see KTR Project as a Whole assessment, to prevent the works identified occurring concurrently, to avoid the potential for combined excessive noise levels.

14.149 The residual cumulative effect magnitude would become low after the additional mitigation is applied which would represent **minor** effects which are **not significant**.

14.150 As set out in **Tables 14.29**, there is the potential for cumulative increases in operational noise due to contributions from the P-G via K and G-T connections and BG Deviation. The Glenlee Substation Extension Project did not include operational noise considerations as this was scoped out. The relevant predictions are set out in **Table 14.31**, for receptors including Staffa, Carville and Navaar. The predictions show that cumulative operational noise levels do not exceed 30 dB(A), and therefore would not exceed existing typical background noise levels in the area at the locations considered during rainy conditions. This would still correspond to a very low magnitude of effect on highly sensitive receptors, or **none,** which is **not significant**.

Monitoring

14.151 No specific monitoring measures are considered to be required during construction or operation of the E-G connection.

Summary of Effects

14.152 Works associated with direct and indirect ancillary works for the E-G connection of the KTR Project have **minor** temporary adverse effect at most following mitigation, which is considered **not significant**.

14.153 There are **no significant** effects from operational noise from the proposed OHL for the proposed E-G connection.

14.154 There are **no significant** cumulative effects due to the influence of the other proposed connections of the KTR Project and other proposed developments in the area.

BG Deviation

Existing Conditions

14.155 The desktop work undertaken indicates the general rural character of the Study Area. Background noise levels throughout the area will likely vary according to specific conditions, particularly in relation to natural noise levels such as wind disturbed foliage and watercourse noise, as well as the varying influence of traffic on the road network in some cases. General daytime noise levels are expected to be consistent with relatively quiet conditions for Scotland. Background noise levels in foul weather (typical rainfall conditions) of 30-35dB(A) were estimated earlier in the chapter.

14.156 **Table 14.20** identifies relevant representative noise-sensitive locations identified in the Study Area: this list is not intended to be exhaustive but sufficient to be representative of noise levels typical of those receptors closest to the proposed ancillary works and OHL for the BG Deviation. For example, Carnville and Dunston would be representative of other properties at Glenlee such as Tummel and Rannoch which are located at a similar distance or further away from the activities being assessed. Other locations such as Tarbert, Navaar, Maree, Orrn or Garry are located further away and would experience reduced effects. **Table 14.20** only comprises highly sensitive receptor locations (residential dwellings), no other less-sensitive receptors were identified as relevant in the Study Area. The receptor locations are also illustrated on **Figure 14.1**.

Table 14.20: Representative Noise Receptor Locations for the BG Deviation

ID	Location	Nearest Infrastructure	Approximate Shortest Distance (m)
18	Carville (Glenlee)	Wayleave (felling)	240
		Access Track	200
		Working Area	140
		Proposed OHL	165
		Tower R-BG-102	150
19	Dunston (Glenlee)	Wayleave (felling)	240
		Access Track	210
		Working Area	140
		Tower R-BG-102	160
20	Navaar (Glenlee)	Wayleave (felling)	155
		Access Track	160
		Working Area	100
		Proposed OHL	115
		Tower R-BG-102	100
21	Blackbank (Glenlee)	Wayleave (felling)	170
		Access Track	210
		Working Area	210
		Proposed OHL	190
		Tower R-BG-101	200

Construction Effects

Predicted Construction Effects

14.157 The construction effects associated with ancillary works for the BG Deviation of the KTR Project comprise direct effects: felling of the 80m wayleave and the construction of access tracks and working areas for tower removal and relocation of new towers. The removal of the existing towers along the 'R-BG' Route (Towers R-BG-098 to 102) is considered separately.

Direct effects

14.158 The following worst-case noise levels calculated for key construction activities directly associated with the BG Deviation are set out in **Table 14.21**.

Table 14.21: Predicted Worst-Case Construction Noise Levels for Direct Ancillary Development of the BG Deviation of the KTR Project

Location	Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$		
	Forestry Felling	Access Tracks Construction	Construct Working Areas
Carville (Glenlee)	240m / 57dB	200m / 64dB	140m / 67dB
Dunston (Glenlee)	240m / 57dB	210m / 64dB	140m / 67dB
Navaar (Glenlee)	155m / 61dB	160m / 67dB	100m / 71dB
Blackbank (Glenlee)	170m / 61dB	210m / 64dB	210m / 64dB

14.159 Comparing the values in **Table 14.21** with the criteria set out previously in **Table 14.5** indicates that, with regard to felling activity greater than 150m from receptors and the construction of access tracks and working areas greater than 200m from receptors, as worst-case predicted noise levels do not exceed 65dB L_{Aeq} and the associated duration is unlikely to exceed four weeks, this would correspond to a very low magnitude of effect. Even assuming as a worst-case that construction occurs at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**: this would increase the effect magnitude to low on a high sensitive receptor which would result in **minor** temporary adverse effects, which is **not significant**. Felling and the construction of access tracks and working areas at closer distances are considered below in further detail.

14.160 The construction of access tracks within 160m of Navaar has the potential to correspond to low magnitude effects. However, the length of track within this distance of the property is of 60m which is likely to be completed in less than one week: this represents a **minor** temporary adverse effect which is **not significant**.

14.161 For all receptors considered for the BG deviation, the construction of working areas for tower relocation corresponds to noise levels associated with low magnitude effects at most. Furthermore, this activity will be of short duration (less than one week). This corresponds to a **minor** temporary adverse effect at most, which is **not significant**.

14.162 Having considered the activities of **Table 14.21** individually, all properties considered have the potential to be affected by a combination of these ancillary activities. However, the combined duration of works at all locations is unlikely to exceed four weeks in a year, and levels between 65dB and 75dB L_{Aeq} for only brief periods of less than one week, and therefore would still correspond to a low magnitude of effect at most.

14.163 Overall, even accounting for the potential for weekend work to occur (as a worst-case), the associated effects are considered **minor** temporary adverse effect at most, which is **not significant.**

Direct effects (BG Tower Removal)

14.164 The following worst-case noise levels calculated for tower removal directly associated with the BG Deviation of the KTR Project are set out in **Table 14.22**.

Table 14.22: Predicted Worst-Case Noise Levels Associated with BG Route Tower Removal for the BG Deviation

ID	Location	Approximate Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$
		Tower Removal
18	Carville (Glenlee)	150m / 61dB
19	Dunston (Glenlee)	160m / 60dB
20	Navaar (Glenlee)	100m / 65dB
21	Blackbank (Glenlee)	200m / 58dB

14.165 Since all the residential properties in **Table 14.22** are 100m or more from existing towers, their removal has as a result predicted worst-case noise levels of 65dB L_{Aeq} or less and as the associated duration is likely to be shorter than four weeks, this would correspond to a very low magnitude of effect at most. Even assuming as a worst-case that construction occurs at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**: this would increase the effect magnitude to low on a high sensitive receptor which would result in **minor** temporary adverse effects, which is **not significant.**

14.166 Tower removal works (the removal and breakdown of steel towers and concrete foundations) are not considered as potentially combining with other construction activities considered above, as noise-generating activities associated with tower removal are of very short duration (around 2 days), there is therefore no potential for these activities to overlap with other ancillary work in sufficient proximity for further significant effects to arise.

Additional Mitigation

14.167 No additional mitigation measures are proposed.

Residual Construction Effects

14.168 As no additional mitigation is required, the residual effects magnitude remains low at most for all high sensitivity noise receptors. This corresponds to a **minor** adverse effect, which is **not significant**.

Operational Effects

Predicted Operational Effects

14.169 The following worst-case noise rating levels have been calculated for foul and fair weather conditions along the proposed BG Deviation of the KTR Project as set out in **Table 14.23.**

Table 14.23: Predicted Worst-Case Operational Noise Rating Levels for the BG Deviation

Location	Approximate Shortest Horizontal Separating Distance (m)	Predicted Noise Rating Level (dB, $L_{Ar, Tr}$)	
		Foul Weather	Fair Weather
Carville (Glenlee)	165	20	-5
Navaar (Glenlee)	115	22	-3
Blackbank (Glenlee)	190	20	-5

14.170 The predicted rated levels of **Table 14.23** for foul weather conditions are less than 25dB(A) and therefore likely below existing typical background noise levels in the area at the locations considered during rainy conditions. Based on the guidance of BS 4142, this corresponds to a very low magnitude of effect on a high sensitive receptor. In fair weather conditions, predicted levels are negative which means they would be below the typical hearing threshold. This would correspond to **none**, which is **not significant** under both weather conditions.

Additional Mitigation

14.171 No specific additional mitigation measures are required.

Residual Operational Effects

14.172 There are **no significant** effects from operational noise for the BG Deviation.

Cumulative Effects

14.173 The potential for cumulative effects associated with the BG Deviation in combination with the other connections which comprise the KTR Project and other developments is assessed below.

14.174 Construction noise effects are localised in nature. Considering the location and the likely phasing of the proposed works (see **Chapter 5**), there is the potential for the proposed works to generate combined effects with the proposed P-G via K, E-G and G-T connections. In relation to the proposed Glenlee Substation Extension, this would be completed prior to the start of the BG re-alignment works. Therefore the Glenlee Substation Extension Project would not contribute to cumulative effects with the BG Deviation.

14.175 Specifically, as set out in **Tables 14.29** and **14.30**, Carville, Dunston, Navaar and Blackbank are the only representative receptors identified where potential ancillary works from other connections may combine with the BG Deviation. The assessment presented after **Table 14.30** demonstrates that there are no additional significant effects, corresponding to **none** for some properties.

14.176 However, for properties at Glenlee (such as Carville and Dunston) there is the potential, if the noisiest works within 100m of these properties for the P-G via K, E-G and G-T connections run concurrently, that significant effects could occur. Without mitigation, worst-case effects of medium magnitude on highly sensitive receptors at Glenlee would represent **moderate** temporary adverse effects which are **significant**. Additional mitigation is therefore proposed, see KTR Project as a Whole assessment, to prevent the works identified occurring concurrently, to avoid the potential for combined excessive noise levels.

14.177 The residual cumulative effect magnitude would become low after mitigation which would represent **minor** effects which are **not significant**.

14.178 As set out in **Tables 14.29**, there is the potential for cumulative increases in operational noise due to contributions from the P-G via K, E-G and G-T connections. The Glenlee Substation Extension Project did not include operational noise considerations as this was scoped out. The relevant predictions are set out in **Table 14.31**, for receptors including Carville, Navaar and Blackbank. The predictions show that cumulative operational noise levels do not exceed 30 dB(A), and therefore would not exceed existing typical background noise levels in the area at the locations considered during rainy conditions. This would still correspond to a very low magnitude of effect on highly sensitive receptors, or **none**, which is **not significant**.

Monitoring

14.179 No specific additional monitoring measures are considered to be required during construction or operation of the BG Deviation connection.

Summary of Effects

14.180 Works associated with direct construction activities for the BG Deviation Route of the KTR Project have **minor** temporary adverse effect at most following mitigation, which is considered **not significant** in EIA terms.

14.181 There are **no significant** effects from operational noise from the proposed OHL for the BG Deviation.

14.182 There are **no significant** cumulative effects due to the influence of the other proposed connections of the KTR Project and other proposed developments in the area.

Glenlee to Tongland

Existing Conditions

14.183 The desktop work undertaken indicates the general rural character of the Study Area. Background noise levels throughout the area will likely vary according to specific conditions, particularly in relation to natural noise levels such as wind disturbed foliage and watercourse noise, as well as the varying influence of traffic on the road network in some cases. General daytime noise levels are expected to be consistent with relatively quiet conditions for Scotland. Background noise levels in foul weather (typical rainfall conditions) of 30-35dB were estimated earlier in the chapter.

14.184 **Table 14.24** identifies a number of relevant representative noise-sensitive locations identified in the Study Area: this list is not intended to be exhaustive but sufficient to be representative of noise levels typical of those receptors closest to the proposed ancillary works, tower removal (R route (south)) and transmission line for the G-T connection. **Table 14.24** only comprises highly sensitive receptor locations (residential dwellings), no other less-sensitive receptors were identified as relevant in the Study Area. The receptor locations are also illustrated on **Figure 14.1**.

Table 14.24: Representative Noise Receptor Locations for G-T Connection

ID	Location	Nearest Infrastructure	Approximate Shortest Distance (m)
18	Carville (Glenlee)	Wayleave (felling)	90
		Access Track*2	50
		Working Area	30
		Proposed OHL*1	55
19	Dunston (Glenlee)	Wayleave (felling)	100
		Access Track*2	40
		Working Area	30
20	Navaar (Glenlee)	Wayleave (felling)	80
		Proposed OHL*1	75
21	Blackbank (Glenlee)	Wayleave (felling)	180m
		Windthrow Area (Glenlee Mains)	150
		Access Track	200
		Working Area	160
		Proposed OHL*1	155
22	Boatknowe	Access Track*2	35
		Tower 036 (R)	50
		Tower 037 (R)	240
23	Mallard Cottage (Grennan)	Access Track*2	50
		Tower 042 (R)	40
		Tower 041 (R)	220
		Working Area*2	185
24	Black 'O' The Eye	Access Track*2	150
		Tower 047 (R)	200
25	Killochy Farm	Access Track*2	110
		Working Area*2	170
		Tower 052 (R)	150
		Tower 053 (R)	200
26	Airie Cottage	Wayleave (felling)	220
		Access Track	270
		Working Area	250
		Proposed OHL*1	255
27	Darsalloch	Wayleave (felling)	230
		Windthrow Area	150
		Access Track	230
		Proposed OHL*1	400

ID	Location	Nearest Infrastructure	Approximate Shortest Distance (m)
28	Brennan Cottage	Wayleave (felling)	260
		Access Track	110
		Construction Compound 5	200
29	Mosscroft	Access Track*2	30
		Tower 060 (R)	100
		Tower 061 (R)	190
30	Ken Tor	Access Track*2	50
		Working Area*2	35
		Tower 065 (R)	50
		Tower 066 (R)	260
		Tower 064 (R)	290
31	Nether Ervie Cottage	Access Track*2	50
		Tower 071 (R)	100
		Tower 070 (R)	260
32	Fominoch Cottage	Access Track*2	220
		Working Area*2	220
		Tower 080 (R)	220
33	Craigend	Access Track*2	10
34	Auchenhay	Access Track*2	50
		Tower 107 (R)	130
		Tower 106 (R)	180
35	Drumlane Farm	Access Track*2	65
		Tower 113 (R)	300
		Tower 112 (R)	270
36	Neuk Farm	Access Track*2	100
		Tower 116 (R)	80
		Tower 117 (R)	250
37	Glentoo Farm/Cottage	Access Track*2	20
		Tower 120 (R)	100
		Tower 121 (R)	210
38	Culcrae	Access Track*2	50
		Windthrow Area	290
39	Upper Balannan Farm and Cottages	Wayleave (felling)	200
		Access Track	180
		Access Track*2	200
		Working Area	160
		Tower 131 (R)	150
		Tower 132 (R)	200
		Proposed OHL*1	190
40	The Upper Cottage (Argrennan Mains)	Wayleave (felling)	75
		Access Track	85
		Access Track*2	70
		Working Area	135
		Tower 140 (R)	170
		Tower 141 (R)	70
		Proposed OHL*1	100
41	Woodlands (Argrennan Mains)	Wayleave (felling)	85
		Access Track	85
		Access Track*2	140
		Working Area	135
		Tower 140 (R)	190
		Tower 141 (R)	180
42	Hilldrop Lodge	Access Track*2	230
		Access Track	270
		Working Area	230
		Tower 145 (R)	230
		Proposed OHL*1	250
43	High Clachan	Access Track*2	150
		Working Area	220
		Tower 147 (R)	170
		Tower 146 (R)	270
		Tower 148 (R)	280
		Proposed OHL*1	210
4	Meikleyett House	Access Track	70
		Access Track*2	80
		Working Area	55
		Tower 151 (R)	260
		Tower 152 (R)	120
		Proposed OHL*1	80
45	Langbarns	Access Track	85
		Access Track*2	100
		Working Area	120
		Tower 152 (R)	100
		Proposed OHL*1	65
46	Weir House	Access Track	85
		Access Track*2	160
		Working Area	180
		Tower 152 (R)	160
		Proposed OHL*1	80
47	Meikleyett	Access Track	200
		Working Area	200
		Tower 151 (R)	180

ID	Location	Nearest Infrastructure	Approximate Shortest Distance (m)
		Tower 152 (R)	160
		Proposed OHL*1	115
48	Lynnbank	Access Track	140
		Access Track*2	200
		Working Area	220
		Tower 152 (R)	250
		Proposed OHL*1	145
49	Ashton	Access Track	230
		Proposed OHL*1	230

*1 *Proposed OHL refers to the conductor (nearest infrastructure) for the new proposed lines for each connection of the KTR Project and is relevant to the operational assessment only.*

*2 *Access track/working area construction required for the removal of existing towers for R route (South). Other access tracks/working areas in this table refer to those required for the installation of towers along the G-T connection or associated ancillary works.*

Construction Effects

Predicted Construction Effects

14.185 The construction effects associated with ancillary works for the G-T connection of the KTR Project can be separated into direct and indirect effects. Direct effects include; forestry felling and the construction of temporary site compounds, access tracks and working areas for tower installation. Indirect effects are associated with felling of areas of forestry that are vulnerable to potential windthrow effects as detailed in **Chapter 5**. The removal of existing towers along the R Route (south) connection is considered separately.

Direct effects

14.186 The following worst-case noise levels calculated for key construction activities directly associated with ancillary works for the G-T connection are set out in **Table 14.25**.

Table 14.25: Predicted Worst-Case Construction Noise Levels for the G-T Connection

Location	Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$			
	Wayleave Felling	Construction of Temporary Site Compound	Construction of Working Areas	Access Tracks Construction
Carville (Glenlee)	90m / 67dB		30m / 82dB	
Dunston (Glenlee)	100m / 67dB		30m / 82dB	
Navaar (Glenlee)	80m / 68dB			
Blackbank (Glenlee)	115m / 64dB		160m / 66dB	200m / 64dB
Airie Cottage	220m / 58dB		250m / 62dB	270m / 61dB
Darsalloch	230m / 58dB			230 / 63dB
Brennan Cottage	260m / 56dB	200m / 64dB		110m / 70dB
Upper Balannan Farm and Cottages	200m / 59dB		160m / 66dB	80m / 73dB
The Upper Cottage (Argrennan Mains)	75m / 68dB			85m / 72dB
Woodlands (Argrennan Mains)	85m / 67dB		135m / 68dB	85m / 72dB
Hilldrop Lodge			230m / 63dB	270m / 61dB
High Clachan			220m / 63dB	
Meikleyett House			55m / 76dB	70m / 74dB
Langbarns			120m / 69dB	85m / 72dB
Weir House			180m / 65dB	85m / 72dB
Meikleyett			200m / 64dB	200m / 64dB
Lynnbank			220m / 63dB	140m / 67dB
Ashton				230m / 63dB

14.187 Comparing the values in **Table 14.25** with the criteria set out previously in **Table 14.5** indicates that for properties greater than 150m from felling activity, worst-case predicted noise levels do not exceed 65dB L_{Aeq} and the associated duration is unlikely to exceed four weeks, which corresponds to a very low magnitude of effect on highly sensitive receptors. Assuming as a worst-case that construction occurs at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**, this would increase the effect magnitude to low. Felling at closer distances (within 100m of receptors), namely at Carville, Dunston, Navaar (properties surrounding the Glenlee Substation), The Upper Cottage and Woodlands (Argrennan Mains) could correspond to noise levels associated with low magnitude effects at most, however, the areas required for felling at all these locations are less than 0.2ha and is therefore likely to be completed within one week. Overall the magnitude of effect is low on high sensitive receivers: this would correspond to **minor** temporary adverse effects which are **not significant**. Other activities are considered below in further detail.

14.188 The predicted noise level in **Table 14.25** at Brennan Cottage for the construction of Temporary Site Compound 5 is less than 65dB L_{Aeq} and the associated duration is unlikely to exceed four weeks: this would correspond to a very low magnitude of effect. Worst-case predicted levels associated with the construction of new access tracks 150m or more from residential properties is associated with a very low magnitude of effect given the likely duration of less than four weeks. Even assuming weekend work as a worst-case, as above, this would increase the magnitude of effect for both activities to low on high sensitive receptors, representing a **minor** effect which is **not significant**.

14.189 The construction of each of the working areas and for the erection of proposed towers (for the G-T connection) is likely to be completed within one week, which would generally be associated with effects of low magnitude at most. When this is undertaken within 50m of highly sensitive receptors, such as for Carville and Dunston: given the associated predicted worst-case levels of **Table 14.25** and that, as a worst-case, this could occur at weekends, including Saturday afternoon and Sundays based on the working hours set out in **Chapter 5**, it was considered that this could represent an impact of medium magnitude in this instance despite the short duration of the work. This would represent **moderate** temporary adverse effects which are **significant.**

14.190 Worst-case predicted levels associated with the construction of new access tracks 150m or more from residential properties is associated with a very low magnitude of effect at most, given the likely duration of less than four weeks. At closer distances between 70m and 150m (Brennan Cottage, The Upper

Cottage, Meikleyett House, Langbarns, Weir House, Upper Balannan Farm and Lynnbank), predicted worst-case levels in **Table 14.25** would be associated with a potential low magnitude effect. In almost all cases for these receptors, tracks are oriented away from the properties or are less than 100m in length. In this case, works are likely to be completed within one week. In the case of Brennan Cottage, where tracks run relatively parallel to this property, the section of track proposed to be constructed within 150m of the receptor is around 200m in length, which could take more than one week to complete. Assuming as a worst-case that construction works (of access track within 150m of Brennan Cottage) were to occur at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**: this would increase the magnitude of effect to medium, which would result in a **moderate** temporary adverse effect, which is **significant**.

14.191 As the proposed quarry areas for the G-T connection (Gallows Knowe (Q2), Will's Hill (Q3), Hind Craig (Q4), Lochenbreck Quarry (Q5); Craigelwhan (Q6) and Craigelwhan West (Q7)) are more than 700m away from the nearest residential properties identified, and therefore outside of the Study Area, there are **no noise effects** associated with noise from stone quarrying operations. Blasting effects are similarly not expected to be significant but are difficult to predict (see method section) and so will be effectively managed through onsite management procedures described as part of the embedded measures.

14.192 Some properties have the potential to be exposed to noise from multiple ancillary works, specifically: Carville, Dunston, Blackbank (Glenlee), Airie Cottage, Darsalloch, Brennan Cottage, Upper Balannan Farm, The Upper Cottage, Woodlands (Argrennan Mains), Hilldrop Lodge, Meikleyett House, Langbarns, Weir House, Meikleyett and Lynnbank. However, at most of these properties, combined worst-case noise levels would not exceed 75dB L_{Aeq} and the combined duration of works at all locations is unlikely to exceed four weeks in a year. At Carville, Dunston, The Upper Cottage and Meikleyett House, combined worst-case noise levels between 75-82 dB could theoretically occur if works occur concurrently. However, these combination levels would only represent a marginal increase from the individual noise levels assessed above (for the activities in isolation), and this would only be associated with exposure over a short period of one week or less, which would not alter the conclusions of the above assessment.

14.193 For all properties listed, in the case where multiple ancillary works occur consecutively, the works duration may exceed one week but given that the distances would increase as the access track construction would progress, noise levels above 75dB L_{Aeq} would not be experienced for more than a week. This would still correspond to a medium magnitude of effect once the potential for weekend work, including Saturday afternoon and Sundays, is assumed as a worst-case, as set out above when considering the activities in isolation. Overall, these combination effects would not alter the above conclusions: **moderate** temporary effects are likely at most at some properties (Carville, Dunston, Brennan Cottage) which are **significant**.

Indirect effects

14.194 The following worst-case noise levels calculated for felling of windthrow areas associated with the G-T connection are set out in **Table 14.26**.

Table 14.26: Predicted Worst-Case Construction Noise Levels for Felling of Windthrow Areas for the G-T Connection

Location	Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$
Darsalloch	150m / 63dB
Culcrae	290m / 58dB

14.195 Felling associated with windthrow areas are at a distance from nearest sensitive receptors at Darsalloch and Culrae such that likely effects will be of very low magnitude and given the associated duration of less than 4 weeks this corresponds to **none** and is **not significant**.

Direct effects (R Route (South) Tower Removal)

14.196 The following worst-case noise levels calculated for tower removal and track construction required to access existing towers of the R route (south) are set out in **Table 14.27**.

Table 14.27: Predicted Worst-Case Noise Levels Associated with 'R' Route Tower Removal for the G-T Connection

ID	Location	Approximate Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$		
		Tower Removal	Construction of Working Areas	Access Track Construction
18	Carville (Glenlee)	65m / 69dB 180m / 59dB		50m / 77dB
19	Dunston (Glenlee)	55m / 70dB 170m / 60dB		50m / 77dB
22	Boatknowe	50m / 71dB 240m / 56dB		35m / 81dB
23	Mallard Cottage (Grennan)	40m / 74dB 220m / 57dB	185m / 65dB	50m / 77dB
24	Black 'O The Eye	200m / 58dB		150m / 67dB
25	Killochy Farm	150m / 61dB 200m / 58dB	170m / 66dB	110m / 70dB
29	Mosscroft	100m / 65dB 190m / 58dB		30m / 82dB
30	Ken Tor	50m / 71dB 260m / 55dB 290m / 54dB	35m / 81dB	50m / 77dB
31	Nether Ervie Farm/Cottage	100m / 65dB 260m / 55dB		50m / 77dB
32	Fominoch Cottage	220m / 57dB	220m / 63dB	220m / 63dB
33	Craigend			10m / 92dB
34	Auchenhay	180m / 59dB 130m / 62dB		50m / 77dB
35	Drumlane Farm	270m / 55dB 300m / 54dB		65m / 75dB
36	Neuk Farm	80m / 67dB 250m / 56dB		100m / 71dB
37	Glentoo Farm/Cottage	100m / 65dB 210m / 58dB		20m / 86dB
38	Culcrae			50m / 77dB
39	Upper Balannan Farm and Cottages	150m / 61dB 200m / 58dB		150m / 67dB
40	The Upper Cottage (Argrennan Mains)	170m / 60dB 70m / 68dB	45m / 78dB	70m / 74dB
41	Woodlands (Argrennan Mains)	190m / 58dB 180m / 59dB		140m / 67dB
42	Hilldrop Lodge	230m / 57dB		230m / 63dB
43	High Clachan	170m / 57dB 270m / 55dB 280m / 55dB		150m / 67dB

ID	Location	Approximate Shortest Separating Distance and Predicted Noise Level $L_{Aeq, T}$		
		Tower Removal	Construction of Working Areas	Access Track Construction
47	Meikleyett	180m / 59dB		
		160m / 60dB		
44	Meikleyett House	260m / 55dB		80m / 73dB
		120m / 63dB		
45	Langbarns	100m / 65dB		100m / 71dB
46	Weir House	160m / 60dB		160m / 66dB
48	Lynnbank	250m / 56dB		200m / 64dB

14.197 Most of the residential properties in **Table 14.27** are 100m or more from existing towers and their removal has as a result, predicted worst-case noise levels of 65dB L_{Aeq} or less and the associated duration is unlikely to exceed four weeks, this would correspond to a very low magnitude of effect at most on a high sensitive receptor, and therefore correspond to **none** which is **not significant**.

14.198 For properties less than 100m (but greater than 35m) from existing towers, namely Carville and Dunston (Glenlee), Boatknowe, Mallard Cottage, Ken Tor, Neuk Farm and Woodlands (Argrennan Mains), predicted worst-case noise levels correspond to a potential low magnitude of effect at most for the removal of towers for these receptors. Furthermore, noise-generating tower removal works are likely to be completed within less than one week[12] before removal works progress to the next tower, moving further away from noise-sensitive locations, quickly diminishing the noise level further. This corresponds to a **minor** temporary adverse effect at most, which is **not significant**.

14.199 **Table 14.27** shows that most properties have more than one tower proposed for removal located within the 300m Study Area around the properties: the only exceptions are Black 'O' The Eye, Fominoch Cottage, Hilldrop Lodge, Langbarns, Weir House and Lynnbank, where only one tower is proposed to be removed within the Study Area. But in all other cases, noise levels associated with the concurrent removal of two to three towers surrounding each receptor would remain below 75dB $L_{Aeq,}$ with the work undertaken within a week, corresponding to a low magnitude of effect at most. Furthermore, concurrent noisy activity associated with tower removal is unlikely given the sequencing of the work described in **Chapter 5**. There are therefore no additional effects due to the combination of noise associated with the direct removal of several towers affecting any one property.

14.200 The construction of each of the working areas for the removal of existing towers on the R route (south) is likely to be completed within one week, which would generally be associated with effects of low magnitude at most. When this is undertaken within 50m of highly sensitive receptors, such as for Ken Tor and The Upper Cottage, (Argrennan Mains), given the associated predicted worst-case levels of **Table 14.27** and that, as a worst-case, this could occur at weekends, including Saturday afternoon and Sundays based on the working hours set out in **Chapter 5**, it was considered that this could represent an impact of medium magnitude in this instance despite the short duration of the work. This would represent **moderate** temporary adverse effects which are **significant**.

14.201 Access track construction works associated with the removal of existing towers that are between 70m and 40m from highly sensitive receptors (such as in the case of Carville and Dunston (Glenlee), Mallard Cottage, Ken Tor, Nether Ervie Cottage, Auchenhay, Drumlane Farm and Culcrae), could correspond to predicted worst-case levels associated with a potential medium to high magnitude of effect. However, the works in all cases (with the exception of Ken Tor) would be completed within one week as tracks are either oriented away from properties, where noise levels will reduce rapidly as works move away from the receptors, or are shorter than 100m in length (or both). In many cases, existing tracks are present which would only require upgrading. This will reduce the effect in practice and is associated with low magnitude effects.

14.202 However, the section of track proposed to be constructed within 70m of Ken Tor is over 200m in length, which may take more than one week to complete. Assuming as a worst-case that this construction (access tracks within 70m of Ken Tor) was to occur at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**: this would increase the effect magnitude to medium which would result in a **moderate** temporary adverse effect, which is **significant**.

14.203 In some cases, access tracks are proposed in relative proximity (less than 40m at the closest point) and run parallel to or around some residential properties associated with R route (south) removal (in this case for Boatknowe, Mosscroft, Craigend and Glentoo Farm/Cottage). The corresponding closest section of the track would be less than 100m long and therefore also likely to be constructed within one week. However, given the associated predicted worst-case levels of **Table 14.25** at these properties and that, as a worst-case this could occur at weekends, including Saturday afternoon and Sundays based on the working hours set out in **Chapter 5**, it is considered, based on professional judgment, that this could represent an impact of medium magnitude in these instances despite the short duration of the work. This would represent **moderate** temporary adverse effects which are **significant.**

14.204 Given the above considerations, and the levels of **Table 14.27**, the combination of the effects of tower removal works with the associated ancillary works only result in marginally higher noise levels which would not change the conclusions of the above assessment. This accounts for the fact that noise-generating activities associated with tower removal are of very short duration (around two days), there is therefore no potential for these activities to overlap with other ancillary work in sufficient proximity for further significant effects to arise.

14.205 Finally, the potential for the construction activities associated with the tower removal works (**Table 14.27**) to combine with other construction activities for the G-T connection (**Table 14.25**) is considered. This is generally unlikely to occur as the removal of the existing R Route (south) connection will largely occur after the construction of the proposed new G-T connection has been completed, and as both areas of work are largely geographically separate. The exceptions may be for areas where both of these areas of work geographically overlap: in the southern part of the G-T connection, near the properties of **Table 14.28** listed as ID 39 to 48. Some ancillary work such as access track construction may be undertaken over the same period, and removal of some towers may be required to facilitate work for parts of the G-T connection. But when considering the duration and noise levels associated with the works for these properties, and given the assessment above has been undertaken on a worst-case basis for the construction activities occurring in closest proximity of each of the properties considered in each case, combination effects are not increased compared to the above assessment.

Additional Mitigation

14.206 Noise-generating works associated with the construction of working areas within 50m of properties (Carville, Dunston, Ken Tor and The Upper Cottage (Argrennan Mains)) and construction of access tracks (if required) within 150m of Woodlands and Brennan Cottage, within 70m of Ken Tor and within 40m of Boatknowe, Mosscroft, Craigend and Glentoo Farm/Cottage will be limited during weekends to the hours of 08:00 to 13:00 on Saturdays, with no work on Sundays. Activities that are unlikely to give rise to noise audible at sensitive receptors may continue outside of the stated hours.

14.207 These specific restrictions on working hours, in addition to the embedded measures, are likely to be formally documented with D&GC either by way of planning conditions or as part of an agreement under Section 61 of the Control of Pollution Act 1974 for prior consent of works.

Residual Construction Effects

14.208 The proposed location/activity specific additional mitigation measures will reduce direct construction effects, such that their magnitude is low in all cases for all high sensitivity noise receptors. This corresponds to a **minor** temporary adverse effect at most, which is **not significant**. The other activities, more distant from neighbouring sensitive receptors or of very limited extent, will have no adverse effects, corresponding to **none.**

Operational Effects

Predicted Operational Effects

14.209 The following worst-case noise Rating Levels have been calculated for foul and fair weather conditions along the proposed G-T connection as set out in **Table 14.28.**

[12] Although **Chapter 5** estimates a total period of ten days per tower for removal works, the main noise-generating activities (tower and concrete foundation removal) is estimated to take two days

Table 14.28: Predicted Worst-Case Operational Noise Rating Levels for the G-T Connection

Location	Approximate Shortest Horizontal Separating Distance (m)	Predicted Noise Rating Level (dB, $L_{Ar,Tr}$)	
		Foul Weather	Fair Weather
Carville (Glenlee)	55	26	1
Navaar (Glenlee)	75	24	-1
Blackbank (Glenlee)	155	21	-4
Airie Cottage	255	18	-7
Darsalloch	400	16	-9
Upper Balannan Farm and Cottages	190	20	-5
The Upper Cottage (Argrennan Mains)	100	23	-2
Hill Drop Lodge	250	18	-7
High Clachan	210	18	-6
Meikleyett House	80	24	-1
Langbarns	65	25	0
Weir House	80	24	-1
Meikleyett	115	22	-3
Lynnbank	145	21	-4
Ashton	230	19	-6

14.210 The predicted rated levels of **Table 14.28** for foul weather conditions are between 16 and 26dB(A) and therefore likely below corresponding existing typical background noise levels in the area during rainy conditions at the locations considered. Based on the guidance of BS 4142, this corresponds to a very low magnitude of effect on a highly sensitive receptor and therefore correspond to **none** which is **not significant**. In fair weather conditions, predicted levels are close to zero or negative which means they would be at or below the typical hearing threshold, also representing a very low effect magnitude. This would correspond to **none,** which is **not significant** under either weather conditions.

14.211 As the existing R route (south) connection would not operate at the same time as the proposed G-T connection outside of a short commissioning period, there would not be any substantial combined operational effect between existing and proposed lines.

Additional Mitigation

14.212 No specific additional mitigation measures are required.

Residual Operational Effects

14.213 There are **no significant** effects from operational noise for the proposed G-T connection.

Cumulative Effects

14.214 The potential for cumulative effects associated with the G-T Connection in combination with the other connections which comprise the KTR Project and other developments is assessed below.

14.215 Construction noise effects are localised in nature. Considering the location and the likely phasing of the proposed works (see **Chapter 5**), there is the potential for the proposed works to generate combined effects with the proposed BG Deviation and P-G via K and E-G connections. In relation to the proposed Glenlee Substation Extension, this would be completed prior to the start of the G-T connection works. Therefore the Glenlee Substation Extension Project would not contribute to cumulative effects with the G-T Connection.

14.216 Specifically, as set out in **Tables 14.29** and **14.30**, Carville, Dunston, Navaar and Blackbank are the only representative receptors identified where potential ancillary works from other connections may combine with the G-T Connection. The assessment presented after **Table 14.30** demonstrates that for some of these properties there are no additional significant effects.

14.217 However, for properties at Glenlee (such as Carville and Dunston) there is the potential, if the noisiest works within 100m of these properties for the P-G via K, E-G and G-T connections run concurrently, that significant effects could occur. Without mitigation, worst-case effects of medium magnitude on highly sensitive receptors at Glenlee would represent **moderate** temporary adverse effects which are **significant**. Additional mitigation is therefore proposed, see KTR Project as a Whole assessment, to prevent the works identified occurring concurrently, to avoid the potential for combined excessive noise levels.

14.218 The residual cumulative effect magnitude would become low after the additional mitigation is applied, which would represent **minor** effects which are not significant.

14.219 As set out in **Table 14.29**, there is also the potential for cumulative increases in operational noise due to contributions from the the P-G via K, E-G connections and BG Deviation. The Glenlee Substation Extension Project did not include new sources of operational noise so this aspect was scoped out. The relevant predictions are set out in **Table 14.31**, for receptors including Carville, Navaar and Blackbank (representative of properties surrounding the Glenlee Substation where the new KTR Project connections converge). The predictions show that cumulative operational noise levels do not exceed 30dB(A), and therefore would not exceed existing typical background noise levels in the area at the locations considered during rainy conditions. This would still correspond to a very low magnitude of effect on highly sensitive receptors, or **none**, which is **not significant**.

Monitoring

14.220 No specific additional monitoring measures are considered to be required during construction or operation of the G-T connection and decommissioning of R route (south).

Summary of Effects

14.221 Works associated with direct and indirect ancillary works of the G-T connection and existing tower removal along the R route (south) have **minor** temporary adverse effects at most following additional mitigation, which are considered to be **not significant**.

14.222 There are **no significant** effects from operational noise from the proposed OHL for the G-T connection.

14.223 There are **no significant** cumulative effects due to the influence of the other proposed connections of the KTR Project or other proposed developments in the area.

KTR Project as a Whole: Assessment of Effects

Construction Effects

Predicted Construction Effects

14.224 The construction noise effects considered are localised in nature, therefore limiting the potential for increased effects due to the combination of the different proposed connections of the KTR Project. There is however the potential in some cases for the different activities associated with more than one individual connection to overlap in such a way that they could combine to result in an increased magnitude of effect on a receptor. Therefore, this section considers the situations where there is potential for combined effects to occur on receptors relevant to multiple connections of the KTR Project, taking into account the description of the works set out in **Chapters 4** and **5**, their locations and the likely phasing of the proposed works.

14.225 **Table 14.29** highlights relevant representative noise-sensitive locations identified in the Study Area where an overlap between different connections could occur. This list is not intended to be exhaustive but sufficient to be representative of those receptors closest to the relevant construction activities.

14.226 Tower removal of the N and R Routes (north and south) will in most cases occur after ancillary work for other connections has been completed, with the exception of removal of some towers to facilitate work for some parts of the connections (such as the E-G Connection). Furthermore, noise-generating activities associated with tower removal are of very short duration (around two days) within the context of the overall preparation works over a ten day period. There is therefore not considered to be a potential for these activities to overlap with other ancillary work in sufficient proximity to residential receptors for further significant effects to arise due to the removal of the N and R Routes in combination with

construction of the new OHLs. This aspect is therefore not considered further as part of the combined effects of construction activities.

14.227 Furthermore, noise-generating enabling works (ancillary work within the scope of the assessment) for the proposed C-K connection are not anticipated to commence until mid-to-late 2023, when the relevant enabling works for the proposed P-G via K connection is predicted to be completed and therefore concurrent combined construction noise effects are not considered for these connections. **Table 14.29** only comprises highly sensitive receptor locations (residential dwellings), no other less-sensitive receptors were identified as relevant in the Study Area. The receptor locations are also illustrated on **Figure 14.1**.

Table 14.29: Representative Noise Receptor Locations Considered for Potential Combined Effects for Multiple Connections of the KTR Project as a Whole

ID	Location	Relevant Connection	Nearest Infrastructure	Approximate Shortest Horizontal Distance (m)
8	Stonebyres (Kendoon) *	P-G via K	Proposed OHL**	30
		C-K	Proposed OHL	5
11	Stroangassel Farm*	P-G via K	Proposed OHL	160
		C-K	Proposed OHL	125
12	Carsfad Cottage*	P-G via K	Proposed OHL	105
		C-K	Proposed OHL	75
16	Staffa	P-G via K	Proposed OHL	340
			11kV undergrounding	15
			Access Track	290
		E-G	Proposed OHL	140
			Felling	120
			Working area	170
17	Waterside	P-G via K	Access Track	260
		E-G	Working area	150
			Access Track	155
18	Carville (Glenlee)	P-G via K	Wayleave (felling)	230
			Access Track	180
			11kV undergrounding	30
			Working Area	80
			Proposed OHL	210
		E-G	Wayleave (felling)	80
			Working Area	80
			Proposed OHL	120
			Underground cabling into substation	30
		BG Dev.	Wayleave (felling)	240
			Access Track	200
			Working Area	140
			Proposed OHL	165
		G-T	Wayleave (felling)	90
			Access Track	50
			Working Area	30
			Proposed OHL	55
19	Dunston (Glenlee)	P-G via K	Wayleave (felling)	230
			Access Track	190
			11kV undergrounding	30
			Working Area	90
			Proposed OHL	115
		E-G	Wayleave (felling)	90
			Working Area	90
			Proposed OHL	120
			Underground cabling into substation	40
		BG Dev.	Wayleave (felling)	240
			Access Track	210
			Working Area	140
			Proposed OHL	120
		G-T	Wayleave (felling	100
			Access Track	40
			Working Area	30
			Proposed OHL	55
20	Navaar (Glenlee)	P-G (via K)	Proposed OHL	220
		BG Dev.	Access Track	160
			Working Area	100
			Wayleave (felling)	155
			Proposed OHL	115
		G-T	Wayleave (felling)	80
			Proposed OHL	75
21	Blackbank (Glenlee)	BG Dev.	Wayleave (felling)	170
			Access Track	210
			Working Area	210
			Proposed OHL	190
		G-T	Wayleave (felling)	180
			Access Track	200
			Working Area	160
			Proposed OHL	155

*For P-G via K and C-K connections, only operational noise is considered for potential combined effects as, due to the phasing of the construction programme, ancillary works for these connections will not occur at the same time.

** Proposed OHL refers to the conductor (nearest infrastructure) for the new proposed lines for each connection of the KTR Project and is relevant to the operational assessment only.

14.228 The worst-case noise levels **Table 14.30** have been calculated based on the combination of different noise-producing activities which could potentially occur simultaneously for the relevant receptors identified.

Table 14.30: Predicted Worst-Case Combined Construction Noise Levels for Receptors Considered in Multiple Connections of the KTR Project

Location	Predicted Noise Levels (dB L_{Aeq})					Potential Predicted Combined Noise Levels (dB L_{Aeq})
	Relevant Connection	Forestry Felling	Access Tracks Construction	Working Area	Laying of Underground Cable	
Staffa	P-G via K		60		83	83
	E-G	64		66		
Waterside	P-G via K		61			69
	E-G	61		67		
Carville (Glenlee)	P-G via K	58	65	73	77	86
	E-G	68		73	77	
	BG Dev.	57	64	67		
	G-T	67	77	82		
Dunston (Glenlee)	P-G (via K)	58	64	72	77	86
	E-G	67		72	75	
	BG Dev.	57	64	67		
	G-T	67	80	82		
Navaar (Glenlee)	BG Dev.	61	67	71		74
	G-T	68				
Blackbank (Glenlee)	BG Dev.	61	64	64		72
	G-T	64	64	66		

14.229 **Tables 14.29** and **14.30** identify receptors where potential ancillary works from multiple connections may combine. Potential combined ancillary effects are considered under two scenarios: where ancillary works run consecutively, therefore extending the time a receptor is subjected to noise effects, and under the scenario that the works run concurrently.

14.230 At Staffa, combined worst-case noise levels based on a concurrent scenario are marginally higher than those for the individual connections considered (and dominated by the undergrounding of the existing 11kV OHL for the P-G via K connection), which would be very limited in time (less than one week). Even assuming consecutive works, the combined duration of works is unlikely to exceed four weeks in a year, and levels would be above 65dB L_{Aeq} (the threshold for effects of low magnitude) for only brief periods of less than one week at a time. At other periods, the predicted levels would still correspond to a very low magnitude of effect at most. Even assuming as a worst-case that construction occurs at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**: this would increase the effect magnitude to low. Overall, given the low magnitude of effects at most on this high sensitive receptor, a **minor** temporary effects is likely, which is **not significant**.

14.231 For Waterside, Navaar and Blackbank, in the event that ancillary works (access track and working area construction and felling) occur simultaneously, work is likely to be completed within one week and worst-case combined noise levels are only marginally higher than those for the individual connections considered, and remain below 75dB L_{Aeq}. Under the scenario where works do not occur concurrently (i.e. they run consecutively), there is the potential for works to exceed one week in duration overall, however, the combined duration of works at all locations is unlikely to exceed four weeks in a year, and levels would be above 65dB L_{Aeq} (the threshold for effects of low magnitude) for only brief periods of less than one week at a time. At other periods, the predicted levels would still correspond to a very low magnitude of effect at most. Even assuming as a worst-case that construction occurs at weekends, including Saturday afternoons and Sundays, based on the working hours set out in **Chapter 5**: this would increase the effect magnitude to low. Overall, given the low magnitude of effects at most on high sensitive receptors, **minor** temporary effects are likely, which is **not significant.**

14.232 In relation to the Carville and Dunston representative properties at Glenlee: in the event that all ancillary works for these two receptors run concurrently, works are likely to be completed within one week, which would generally be associated with effects of low magnitude. The combined worst-case noise levels of **Table 14.30** are marginally higher than those for the individual connections considered (and dominated by those of the G-T, E-G and P-G via K connections) and would reach 86dB L_{Aeq} in theory. Given these predicted levels and that, as a worst-case, this could occur at weekends, including Saturday afternoons and Sundays based on the working hours set out in **Chapter 5**, it is considered, based on professional judgement, that this could represent effects of medium magnitude in this instance despite the very short duration of the work.

14.233 Under the scenario where works near the properties at Glenlee (Carville and Dunston) run consecutively: there is the potential for works to exceed one week in duration overall (but not four weeks in a year). However, outside of the works associated with the G-T Connection, which were associated with potential moderate temporary adverse effects, predicted noise levels would be between 65dB-77dB L_{Aeq} for only very brief periods of less than one week, corresponding to low magnitude effects at most. Other activities may last longer but are only associated with predicted worst-case levels of 57-64 dB L_{Aeq}. Assuming as a worst-case that the works could occur at weekends, including Saturday afternoons and Sundays based on the working hours set out in **Chapter 5**, the proposed works for the KTR Project as a Whole (considering in particular those associated with the G-T Connection) could represent effects of medium magnitude in this instance despite the very short duration of the work.

14.234 In either scenario, worst-case effects of medium magnitude on highly sensitive receptors at Glenlee would represent **moderate** temporary adverse effects which are **significant**.

Additional Mitigation

14.235 As discussed in the proposed mitigation for the G-T Connection, it is proposed to limit weekend work as follows: noise-generating works associated with the construction of working areas within 50m of properties (Carville and Dunston) will be limited during weekends to the hours of 08:00 to 13:00 on Saturdays, with no work on Sundays. Activities that are unlikely to give rise to noise audible at sensitive receptors may continue outside of the stated hours.

14.236 Furthermore, the noisiest activities for the P-G via K, E-G and G-T connections (access tracks construction, building working area and laying of underground cable (for both E-G and 11kV associated with P-G via K) should not occur concurrently in proximity to the closest properties at Glenlee (*i.e.* works within 100 m of the Carville and Dunston properties) to limit the potential for combined excessive noise levels. This may be unlikely in any case due to programme considerations.

14.237 These specific restrictions on programme and working hours, in addition to the embedded measures, are likely to be formally documented with D&GC either by way of planning conditions or as part of an agreement under Section 61 of the Control of Pollution Act 1974 for prior consent of works.

Residual Construction Effects

14.238 The proposed additional mitigation measures will reduce direct construction effects, such that their magnitude is low in all cases for all high sensitivity noise receptors. This corresponds to a **minor** temporary adverse effect at most, which is not significant. The other activities, more distant from neighbouring sensitive receptors or of very limited extent, will have **no significant** adverse effects.

Operational effects

Predicted Operational Effects

14.239 For the properties listed in **Tables 14.29**, operational noise from the individual connections may combine to result in increased noise levels: see **Table 14.31**. This considers predictions for foul weather conditions only on the basis that fair-weather conditions result in levels 25dB lower and correspond to very low levels in all cases, as assessed previously.

Table 14.31: Predicted Worst-Case Combined Operational Noise Levels for Receptors Considered in Multiple Connections of the KTR Project (foul weather)

Location	Relevant Connection	Predicted Noise Rating Level (dB, $L_{Ar,\,Tr}$)	Potential Predicted Combined Noise Levels (dB $L_{Aeq,\,T}$)
Stonebyres (Kendoon)	P-G via K	15	39

Location	Relevant Connection	Predicted Noise Rating Level (dB, $L_{Ar, Tr}$)	Potential Predicted Combined Noise Levels (dB $L_{Aeq, T}$)
	C-K	39	
Stroangassel Farm	P-G via K	6	25
	C-K	25	
Carsfad Cottage	P-G via K	7	28
	C-K	28	
Staffa	P-G via K	2	25
	E-G	25	
Carville (Glenlee)	P-G via K	7	30
	E-G	26	
	BG Dev.	20	
	G-T	26	
Navaar (Glenlee)	P-G via K	4	26
	BG Dev.	22	
	G-T	24	
Blackbank (Glenlee)	BG Dev.	20	24
	G-T	21	

14.240 It is clear from **Table 14.31** that the combined operational noise effects predicted for the proposed OHLs result in either negligible or marginal increases in the predicted noise levels than those of the individual connections, resulting in identical or comparable results to the individual connection assessments. The potential predicted combined worst case operational noise levels associated with Stroangassel Farm, Carsfad Cottage, Staffa, Carville, Navaar and Blackbank are all at or below 30dB(A) and therefore unlikely to exceed existing typical background noise levels in the area at the locations considered. Based on the guidance of BS 4142 this corresponds to a very low effect magnitude on highly sensitive receptors, and therefore correspond to **none** which is **not significant.**

14.241 Worst case predicted combined noise levels for Stonebyres (and representative properties surrounding the Kendoon Substation) have not increased from those predicted previously for the C-K and P-G (via K) connections – the proposed C-K connection being the louder of the two. As noted above, this represents at most a negligible change from the baseline levels from the existing OHL (N and R route (north)) at this location, corresponding to **none** which is considered **not significant**.

Additional Mitigation

14.242 No additional mitigation is considered to be required.

Residual Effects

14.243 There are **no significant** operational effects from the KTR Project as a Whole.

Assessment of Cumulative Effects

14.244 This assessment has considered the cumulative effect of the KTR Project as a whole with other known developments within the Study Area, comprising the proposed Glenlee Substation Extension which is the subject of a separate application for planning permission and its own EIA Report (submitted to D&GC in September 2019). Other developments in the area are greater than 1km away and are therefore at a sufficient distance such that no additional cumulative operational or construction noise effects would arise.

Cumulative Effects

Likely Effects

14.245 Based on the indicative work programmes for the KTR Project and the proposed Glenlee Substation Extension, any works associated with KTR Project are predicted to be carried out during the final four months (March to June 2022) of the construction of the Glenlee Substation Extension, during which, construction and base earthworks (the nosiest activities) are expected to have been completed. Enabling works (ancillary) for the proposed P-G via K, E-G, BG Deviation and G-T connections are anticipated to begin at the earliest in March 2022, when the Glenlee Substation Extension will be undergoing commissioning work. The activity noise levels associated with this commissioning phase are considered to be relatively low and such that they would not substantially increase the predictions beyond those set out above in **Table 14.30** for the nearest representative properties considered (Carville/ Dunston). Other activities associated with the C-K connection and removal of the existing OHLs along the N and R Routes are anticipated to commence at a later date (after commissioning of the Glenlee substation extension), therefore no cumulative construction effects would arise.

14.246 The Glenlee Substation Extension project does not involve the introduction of noise generating equipment during its operational phase: therefore, there will be no operational noise effects from this scheme and this aspect was scoped out.

14.247 Therefore, **no significant** cumulative effects are predicted.

Proposed Mitigation

14.248 No additional mitigation measures are required in relation to cumulative construction or operational effects of the KTR Project as a Whole with other developments.

Residual Effects

14.249 **No significant** cumulative effects were identified.

Summary of Significant Effects

14.250 **Table 14.32** below summarises the predicted likely significant effects of construction works associated with each connection of the KTR Project, as well as the KTR Project as a Whole, and details the additional mitigation proposed and identifies the residual effects. The representative receptors involved in each case are also set out. There are no significant operational effects associated with each individual connection, KTR as a Whole or cumulatively with other developments.

Table 14.32: Summary of Significant Construction Noise Effects for the KTR Project

Representative Receptor	Predicted Effect	Mitigation Proposed	Significance of Residual Effect
P-G via K			
High Carminnows – Construction of Site Compound 1 within 200m Stonebyres (Kendoon) – Felling within 100m Karnak – Construction of access tracks within 150m Afric - tower removal within 100m	**Moderate**	Restriction on weekend working hours	**Minor**
C-K			
Carsfad Cottage, Stonebyres, Kinross – Felling within 100m	**Moderate**	Restriction on weekend working hours	**Minor**
E-G			
Carville and Dunston (Glenlee) – Laying of underground cable within 100m	**Moderate**	Restriction on weekend working hours	**Minor**
G-T			

Representative Receptor	Predicted Effect	Mitigation Proposed	Significance of Residual Effect
Carville and Dunston (Glenlee) and The Upper Cottage, Argrennan Mains - Construction of working areas within 50m Ken Tor - Construction of working areas within 50m and access tracks within 70m Woodlands and Brennan Cottage – Construction of access tracks within 150m Boatknowe, Mosscroft, Craigend and Glentoo Farm/Cottage – Construction of access tracks within 40m	**Moderate**	Restriction on weekend working hours	**Minor**
KTR Project as a Whole			
Carville and Dunston (Glenlee) - construction	**Moderate**	Restriction on weekend working hours Avoiding simultaneous work on access tracks construction, building working area and laying of underground cable (E-G and P-G via K) within 100m of the properties identified.	**Minor**

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Figure 14.1.1: Noise Assessment Locations

Polquhanity terminal tower

Kendoon substation

Carsfad substation

Earlstoun substation

Glenlee substation

- Polquhanity sealing end and terminal tower
- Substation and hydro electricity generating station
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Existing network
- Polquhanity to Glenlee via Kendoon
- Carsfad to Kendoon
- Earlstoun to Glenlee
- BG route deviation
- Glenlee to Tongland
- KTR infrastructure

Noise Property Receptor

- Construction/Decommissioning and Operational
- Construction/Decommissioning Only
- Construction/Decommissioning and Operational (Earlstoun to Glenlee), Construction/Decommissioning Only (Polquhanity to Glenlee)

1. High Carminnows
2. Dalshangan Lodge
3. Karnak
4. Polmaddie Farm
5. 4, Dalshangan Road
6. The Cabin/Deughside
7. Phail Barcris, Dalry
8. Stonebyres
9. Afric
10. Kinross
11. Stroangassel Farm
12. Carsfad Cottage
13. Inverharrow
14. Barkeoch Mains
15. Alangibbon
16. Staffa
17. Waterside
18. Carville
19. Dunston
20. Navaar
21. Blackbank
22. Boatknowe
23. Mallard Cottage
24. Black 'O The Eye
25. Killochy Farm
26. Airie
27. Darsalloch
28. Brennan Cottage
29. Mosscroft
30. Ken Tor
31. Nether Ervie Farm/Cottage
32. Fominoch Cottage
33. Craigend

0 2.5 5 km

Map Scale @ A3: 75,000

LUC

SP ENERGY NETWORKS

CB:JN EB:nunn_j LUCGLA FIG14-01_6120-001-r1_KTR_KTR_Noise Propoerties_A3 30/07/2020

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Figure 14.1.2: Noise Assessment Locations

- Substation and hydro electricity generating station
- Existing 132kV overhead line to be removed (following construction of the KTR Project)
- Existing network
- Glenlee to Tongland
- KTR infrastructure

Noise Property Receptor

- Construction/Decommissioning and Operational
- Construction/Decommissioning Only

28. Brennan Cottage
31. Nether Ervie Farm/Cottage
32. Fominoch Cottage
34.
35. Drumlane Cottage
36. Neuk Farm
37. Glentoo Farm/Cottage
38. Culcrae
39. Upper Balannan Farm and Cottages
40. The Upper Cottage
41. Woodlands
42. Hilldrop Lodge
43. High Clachan
44. Meikleyett House
45. Langbarns
46. Weir House
47. Meikleyett
48. Lynnbank
49.

Tongland substation

0 2.5 5 km

Map Scale @ A3: 75,000

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SP ENERGY NETWORKS

Appendix 14.1: Baseline Operational Noise Survey

Appendix 14.1: Baseline Operational Noise Survey; Stonebyres.

Noise Monitoring Information Sheet

Noise Monitoring Information Sheet	
Name	Stonebyres
Description	The sound level monitoring system was setup in the rear garden of the property, off the mowed areas of the lawn. This was preferred by the resident because of the presence of dogs at the property. The measurement system was set to make measurements in 15 minute intervals with regular sampling of audio recordings of two minutes duration started every ten minutes. A tipping bucket rain gauge was also installed in close proximity to the sound level meter. In the front garden, the noise from the Kendoon substation was apparent. There is also a heating flue but at this time of year (July) it was considered unlikely to be in use for extended periods of time. The rear garden was relatively screened from the noise from the substation, although it was still present to a reduced level. Traffic noise from the A713 was a more dominant source in the rear garden area during the site visits. Also audible during lulls in traffic noise was the water flow in the Waters of Ken and birdsong. The resident explained that, when the nearby hydro power station is operating, increased noise levels are perceived from flow in the Water of Ken, and that this was the case at times during the survey period (see below). Sound level meter approximate location: NX 60479 87619 (acc. six metres) see site map below.

Equipment	**Type**	**Serial Number**	**Last Calibrated**
Sound Level Meter	Rion NL-52	00632044	10/10/2017
Microphone	Rion UC-59	05211	10/10/2017
Pre-amplifier	Rion NH-25	32072	10/10/2017
Calibrator	Brüel and Kjær Type 4231	2498799	05/04/2019
SLM Range	20 – 140 dB(A)		

Data Collected						
File	**Time Start [GMT]**	**Time End [GMT]**	**Cal Start**	**Cal End**	**Drift**	**Notes**
1	24/07/2019 12:00	05/08/2019 13:40	94.0	93.8	-0.2	No significant drift

Information on the measurement location and equipment used.

Views of the installed sound level meter and rain gauge looking approximately east: ac1 of 2

Views of the installed sound level meter and rain gauge looking approximately north-east: 2 of 2

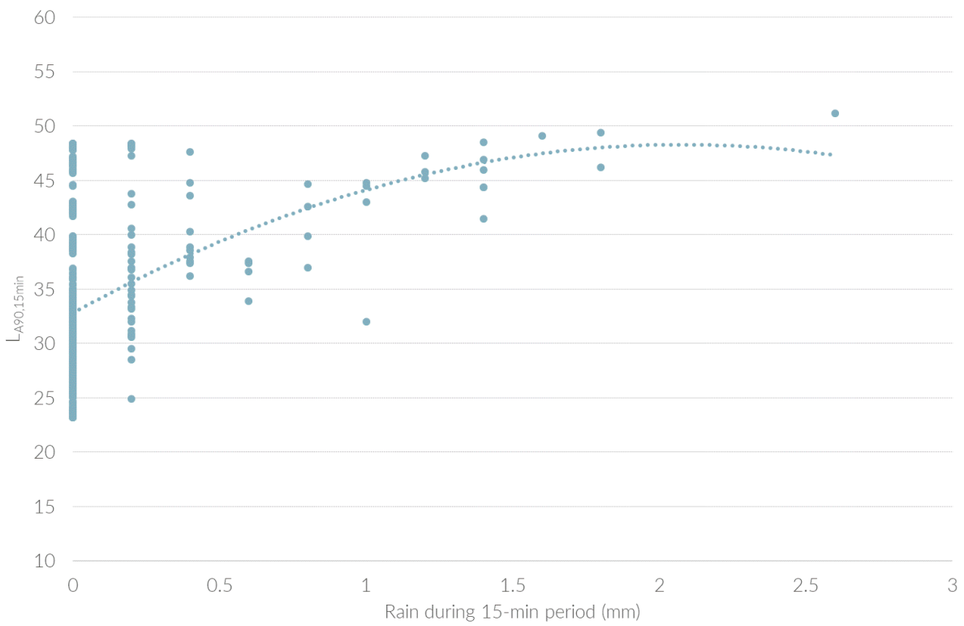


Figure showing the measured $L_{A90,15min}$ results in relation to the rain experienced over the same period during evening/night hours[1].

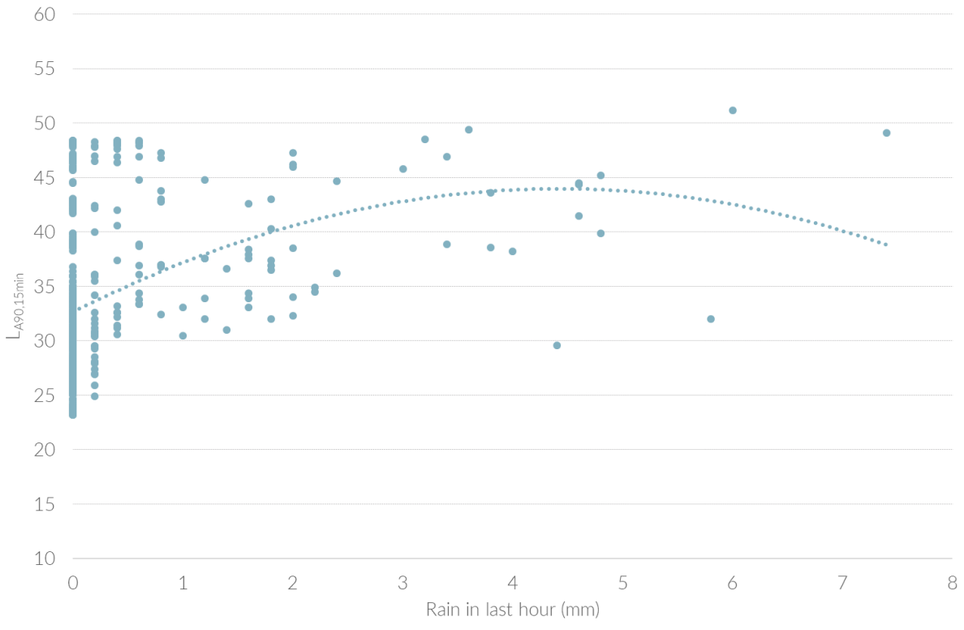
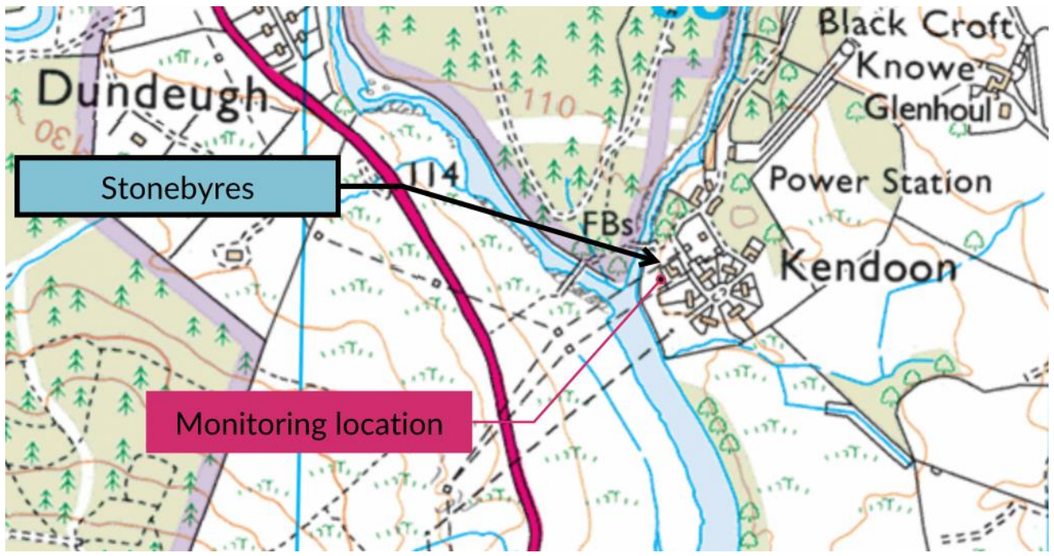


Figure showing the measured $L_{A90,15min}$ results in relation to the rain experienced over the last hour during evening/night hours[1].

[1] Between 18:00 and 06:00 (local time).

Site map

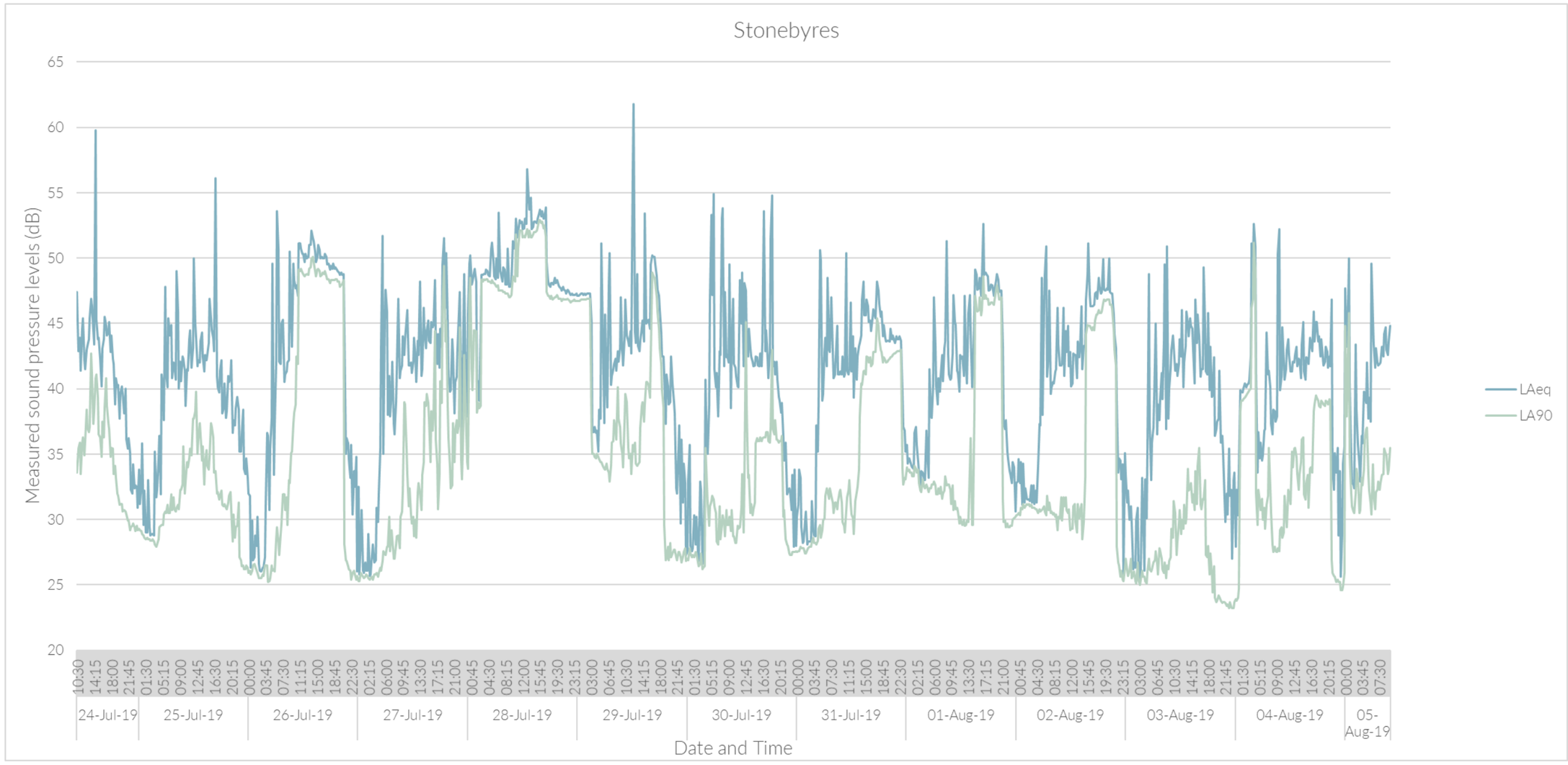


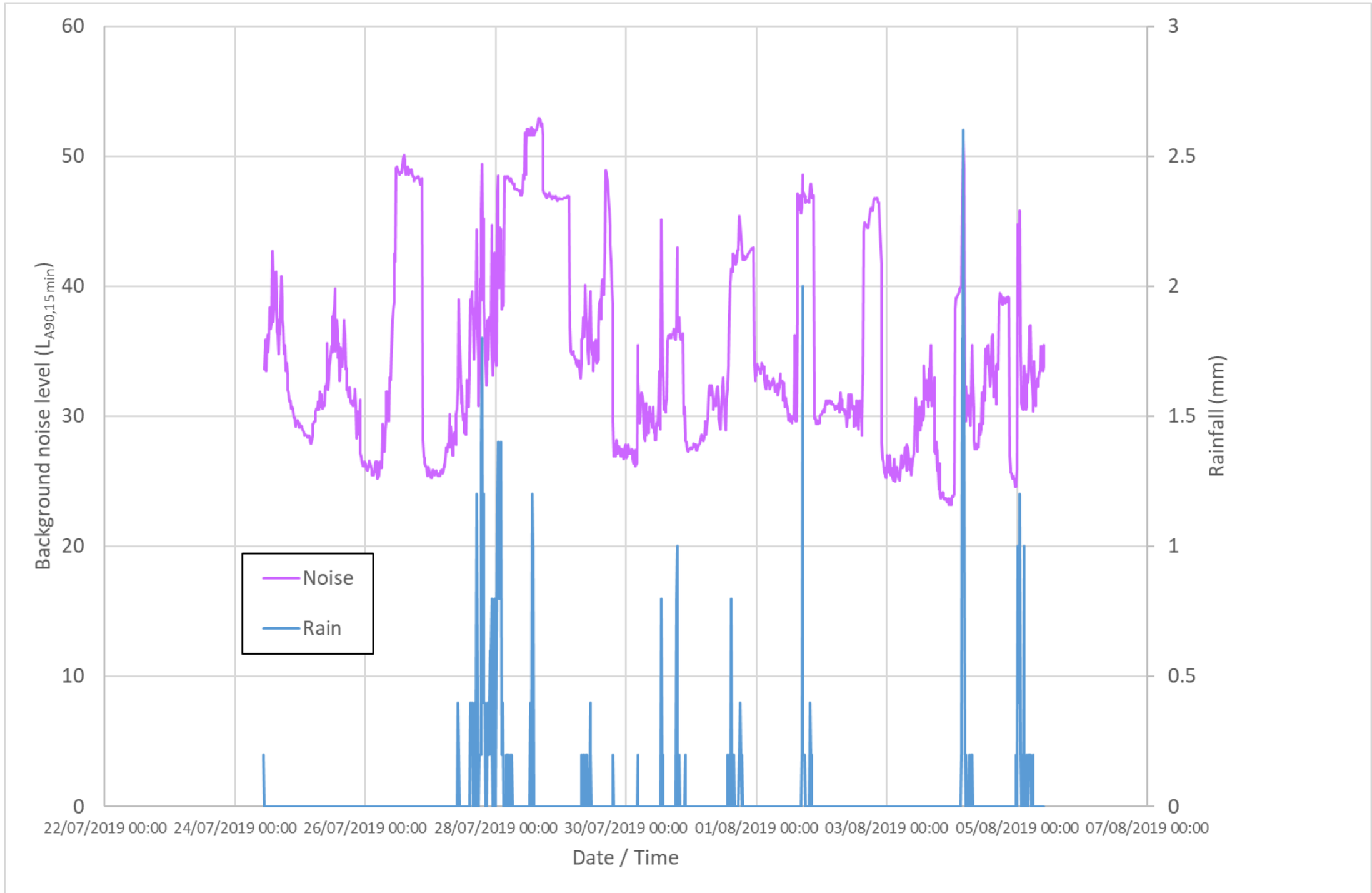
Observations

For some periods following rainfall, a clear humming noise (with tonal characteristics mainly at 100 Hz) was audible in some of the recordings at the measurement location. This is typical of noise from corona discharge from overhead transmission lines. This was the case for example on the 04/08/2019 around 05:00 or 05/08/2019 around 02:00. Noise levels during these periods varied around 30 to 35 decibels (dB) L_{Aeq}.

Typical background noise levels during quieter evening and night-time periods and during periods of sustained rainfall were clearly above 35 dB L_{A90}. If a wider range of periods following rainfall were considered (*i.e.* any rain during the last hour) then this varied more between 30-35 dB L_{A90} and above. Background levels during drier periods can decrease down to 25 dB L_{A90}.

A notable increase in background noise is apparent on the above charts on the 26/07/2019 and 28/07/2019 for most of the day, with levels increasing consistently to between 47 and 57 dB L_{A90}. Based on the descriptions from the residents, and the audio recordings made, this is likely to be associated with increased water flow in the Water of Ken related to operation of the nearby Hydro power station.


Stonebyres
Measured sound pressure levels (dB)
65
60
55
50
45
40
35
30
25
20
10:30 14:15 18:00 21:45 01:30 05:15 09:00 12:45 16:30 20:15 00:00 03:45 07:30 11:15 15:00 18:45 22:30 02:15 06:00 09:45 13:30 17:15 21:00 00:45 04:30 08:15 12:00 15:45 19:30 23:15 03:00 06:45 10:30 14:15 18:00 21:45 01:30 05:15 09:00 12:45 16:30 20:15 00:00 03:45 07:30 11:15 15:00 18:45 22:30 02:15 06:00 09:45 13:30 17:15 21:00 00:45 04:30 08:15 12:00 15:45 19:30 23:15 03:00 06:45 10:30 14:15 18:00 21:45 01:30 05:15 09:00 12:45 16:30 20:15 00:00 03:45 07:30
24-Jul-19
25-Jul-19
26-Jul-19
27-Jul-19
28-Jul-19
29-Jul-19
30-Jul-19
31-Jul-19
01-Aug-19
02-Aug-19
03-Aug-19
04-Aug-19
05-Aug-19
Date and Time
LAeq
LA90


60
50
40
30
20
10
0
3
2.5
2
1.5
1
0.5
0
Background noise level ($L_{A90,15\,min}$)
Rainfall (mm)
Noise
Rain
22/07/2019 00:00
24/07/2019 00:00
26/07/2019 00:00
28/07/2019 00:00
30/07/2019 00:00
01/08/2019 00:00
03/08/2019 00:00
05/08/2019 00:00
07/08/2019 00:00
Date / Time