From [redacted]
Subject: Wr tten subm ss on for ssue spec fic hear ng 8; No se A r V brat on
Date: 4 September 2021 at 02:42
To: s mon me en [redacted]

Written submission for issue specific hearing 8; **Noise Air Vibration**

Dear Mr Maund

I am writing with my concerns specifically relating to noise, air and vibration pollution along the route of the proposed Green rail route (GRR) . I am a resident who will be adversely affected by the construction of the GRR and the future running of it . I participated in the hearing ISH8 but feel there was insufficient, to convey the points I made and to be fully understood by the panel. I felt that the responses from the applicant's team were incomplete and dismissive.

First may I start by describing the area in question; The planned route for the GRR starts at the western side of Leiston and runs through open agricultural land on the rural outskirts of the town, heading initially north east then east to the main development site. The land is open, it has a small number of hedgerows dividing it which are predominately low and are single row in nature, so can be viewed as acoustically transparent.
The planned route is bordered to the west by Buckles Wood and Abbey lane runs on an elevation to the north running east. To the south is Leiston town and the route heads east cutting into the landscape towards the main development site.

Sound will travel unhindered freely from the proposed route slowly attenuating as it cuts into the landscape heading towards Abbey road past Leiston Abbey . The northern side of Leiston differs from the southern side as the wind flows freely from the predominant South west across open fields from Saxmundum, where the southern side is slightly sheltered by Aldringham and Knodishall . I mention this as one factor which significantly affects sound propagation affecting the route of the GRR .

Secondly I would like to cover the topography . The first section of the GRR from the Leiston branch line to the Abbey road crossing,follows a channel in the land, accelerating air mass as it is funnelled through from the entry point between the north side of Leiston and Buckles Wood down towards Abbey road . When the cut is made on the next section from the eastern side of Abbey road to the Development site, this effect will more than likely worsen . So now we are building up a unique set of parameters; predominant wind direction, the funnelling effect of topography on open landscape with a lack of shielding features , GRR direction coupled with wind effect refracting waves downward increasing intensity , night time temperature inversion effect adding to refraction of sound propagation .
I experienced these effects last year when the testing was carried out using a Class 66/68 locomotives on the branch line and shudder to think how loud it will be when the line is in operation and an approximately 1/2 kilometre train is trundling past my window 160 metres away eight times throughout the night! The nearest point of the proposed route to my property is an elevated section (fill) and a change in direction compounding the problem even more. The Class 66 locomotives do not meet stage 3b emissions regulations . Stage 3b would have required additional exhaust treatment equipment that could not easily be accommodated within the UK loading gauge. The same restrictions apply to the Class 68

My question to the applicant is; has full consideration been taken into account with the software used SoundPlan TM in respect of wind speed and direction and the effects of Snell's law of refraction?

I believe it doesn't and the modelling produced using ISO9613-2 implemented in the software as Mr Brownstone stated, uses an equal wind speed downwind in all directions . This isn't sufficient for the unique set of parameters presented by the GRR and the modelling is better suited to more urbanised built up area's similar to the Leiston branch line as it enters into the town .

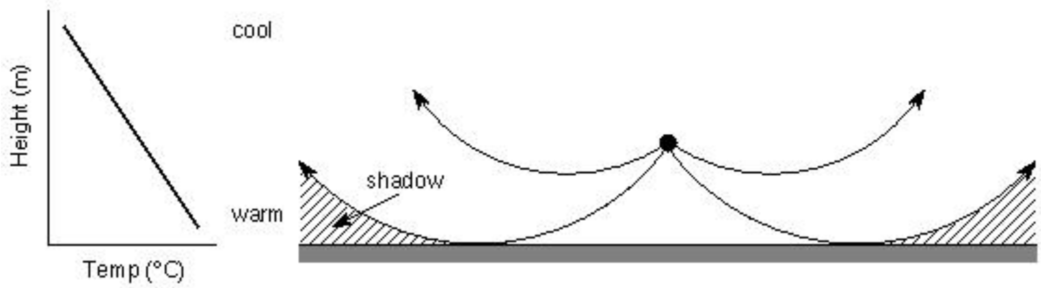
I would suggest that the use of the Nord 2000 module within SoundPlan a better option as it deals with rural areas more accurately and wind speed and direction can be input. The question of whether it too would be able to accurately model the the exact parameters needed could produce a lively debate . So with this in question the need I believe for Accoustic fencing is paramount at the very least along the first section of the GRR and where suitable along the branch line and beyond . Mr Rhodes stated that Network rail would not allow acoustic fencing on their land however the GRR will be free of that restriction and it is crucial to minimise the negative impact caused by the rail noise . I also came across a few anomalies with the modelling given by the applicant which I would like to further discuss with them. These anomolies could easily be be data input errors but need exploring . Below is some background information which better explains the effects referred to :-

Refraction is the change in direction of a wave. **Wind affects the propagation of sound by refracting its waves**. ... Therefore, a person standing downwind of a sound source hears higher levels of sound, while a person standing on the opposite end will hear lower sound levels.

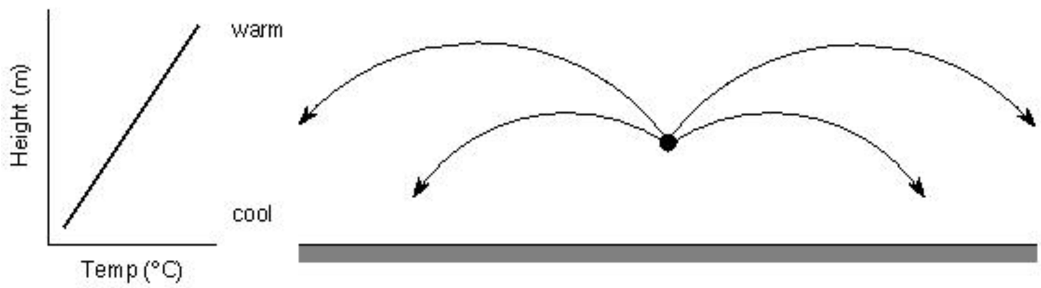
An acoustic wave is a mechanical wave travelling through a medium. The sound we deal with most often is carried through the medium of air, at a speed of around 343 m/s.Wind is the bulk motion of air in a given direction.When you combine these two ideas together, you get that sound is a wave moving through a moving medium. Unsurprisingly, that means that the velocity of acoustic wave is equal to the speed of the wave plus the speed of wind in that direction. IE, if the wind is moving at 20 mph (8.9 m/s), then sound will travel downwind at 351.9 m/s, upwind at 334.1 m/s, and crosswind at the regular 343 m/s. Note that it takes a significant windspeed to appreciably alter the sound speed in any given direction.What's really interesting is how windspeed gradients alter the path that sound takes through the air. As a rule, sound waves bend towards regions of lower sound speed (an effect known as *refraction* that is a direct result of Snell's law). Couple this with the fact that windspeed tends to increase with greater distance from the ground, and you find that sound refracts downward when moving downwind and upward when it's moving upwind.Sound tends to emanate from sources in roughly all directions. Some goes towards the listener, some goes away from the listener, and some shoots up into the sky. When you consider the effect of refraction, the question becomes "Does more sound go into the sky or to the source?" As it turns out, it will depend on where you stand with respect to the wind.If I'm listening to someone far away talking, and there is wind, I probably want to stand downwind of them. Why? Because the sound that normally goes up into the atmosphere will instead refract downwards towards me, focusing on me. Conversely, if I was standing upwind, the sound would refract up and away from me, causing me to receive a lower effective level.

Nord2000: Nordic noise prediction methodThe Nordic noise prediction method, Nord2000, was introduced by the Danish Environmental Protection Agency for strategic mapping of road and railway noise in 2006, and since July 2007 the method has been the prescribed calculation method for road and railway noise.

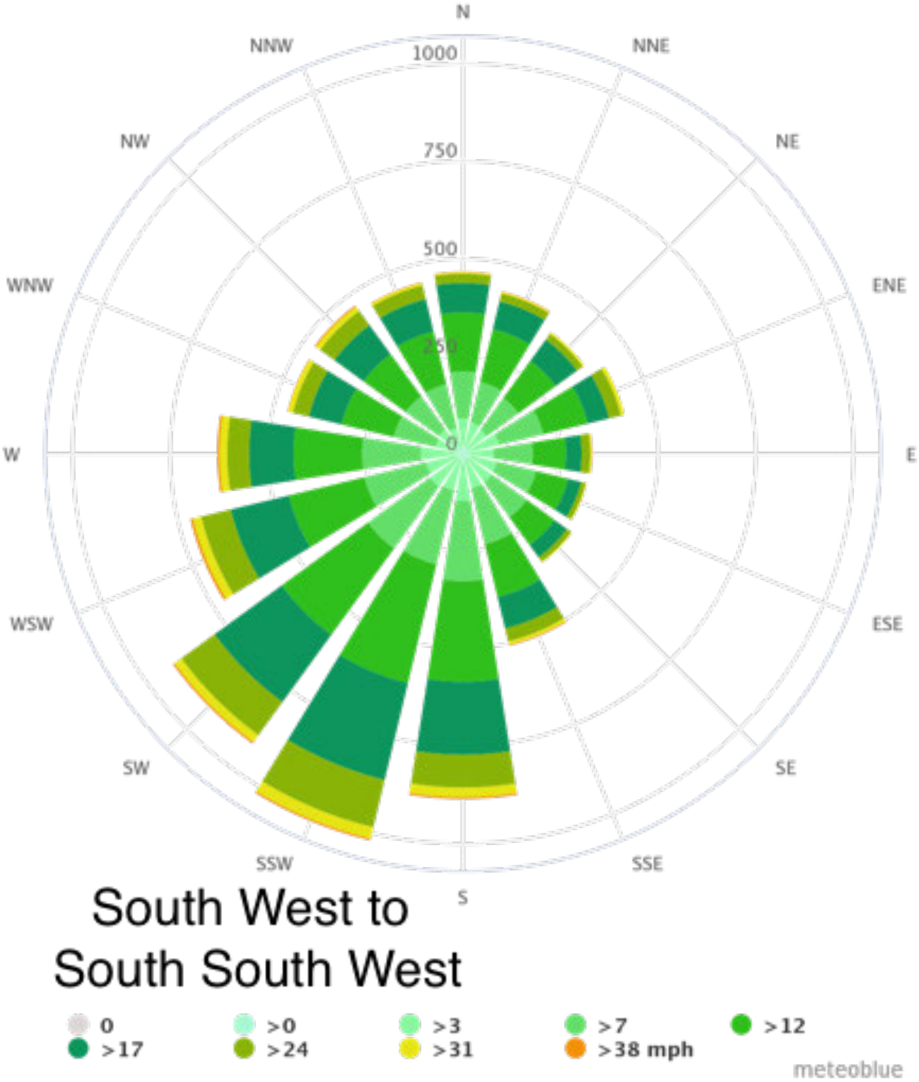
Suppose you are camping on the shore of a lake which is not too wide, maybe 1/2 a mile across or so. During the day you can see campers on the other side of the lake, but you cannot hear them. At night, however, you can not only see the campers on the other side of the lake but you can also hear their conversations as they sit around their camp fire. This phenomena is due to the refraction of sound waves.
The speed of a sound wave in air depends on the temperature ($c=331 + 0.6\ T$) where T is the temperature in ^{o}C. Often the change in the wave speed, and the resulting refraction, is due to a change in the local temperature of the air. For example, during the day the air is warmest right next to the ground and grows cooler above the ground. This is called a **temperature lapse**. Since the temperature decreases with height, the speed of sound also decreases with height. This means that for a sound wave traveling close to the ground, the part of the wave closest to the ground is traveling the fastest, and the part of the wave farthest above the ground is traveling the slowest. As a result, the wave changes direction and bends upwards. This can create a "shadow zone" region into which the sound wave cannot penetrate. A person standing in the shadow zone will not hear the sound even though he/she might be able to see the source. The sound waves are being refracted upwards and will never reach the observer.



A **temperature inversion** is when the temperature is coolest right next to the ground and warmer as you increase in height above the ground. Since the temperature increases with height, the speed of sound also increases with height. This means that for a sound wave traveling close to the ground, the part of the wave closest to the ground is traveling the slowest, and the part of the wave farthest above the ground is traveling the fastest. As a result, the wave changes direction and bends downwards. Temperature inversions most often happen at night after the sun goes down when the ground (or water in a lake) cools off quickly, while the air above the ground remains warm. This downward refraction of sound is why you can hear the conversations of campers across the lake, when otherwise you should not be able to hear them. (remember that they can probably hear you too!)

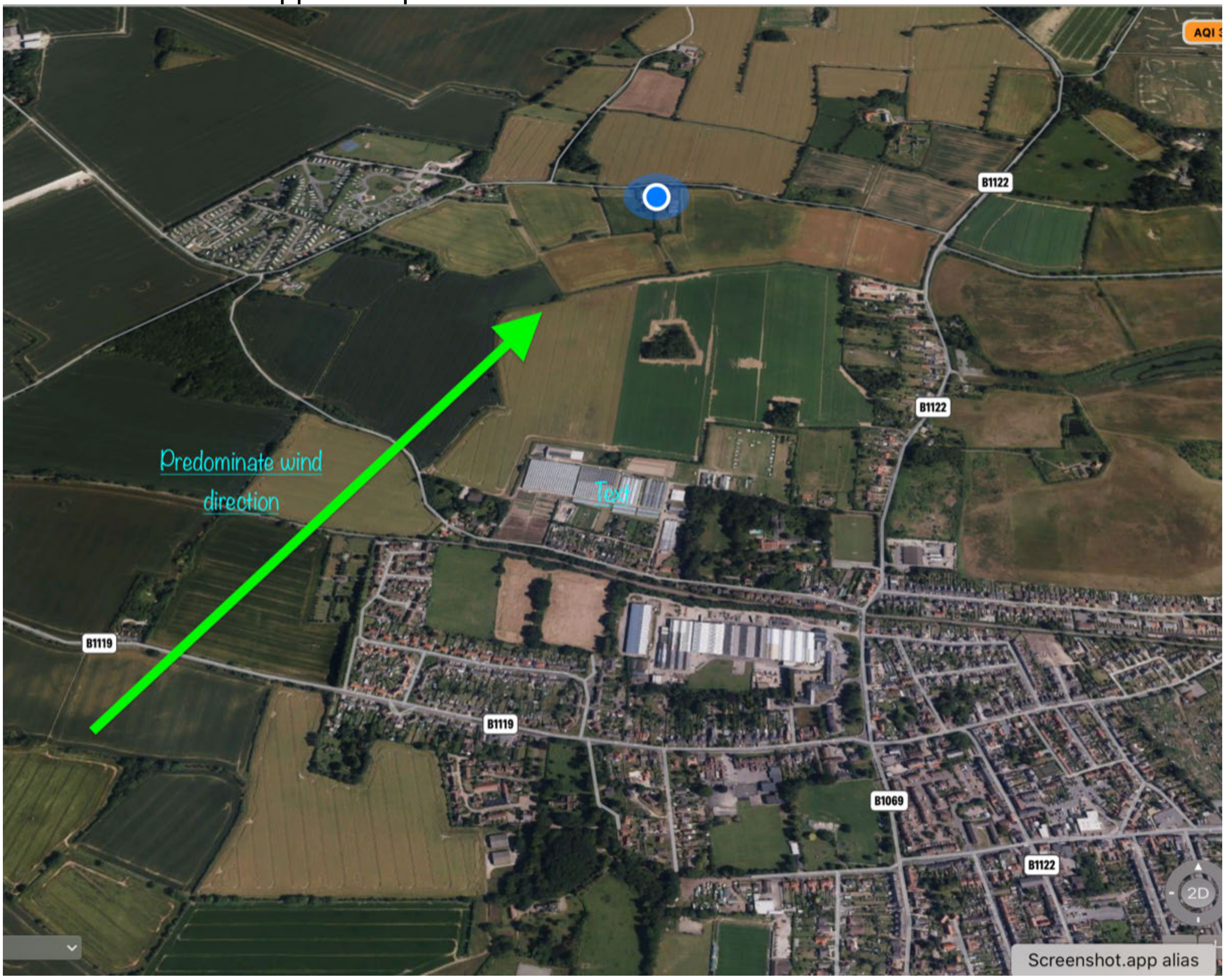


Predominant wind direction for Leiston



South West to
South South West

Wind direction applied to plan of the site



In summary it is my view that although a degree of modelling has been undertaken its suitability to be tested with real world conditions may be questionable . More acoustic surveys and modelling needs to be done and the use of Acoustic fencing needs to be included to absolutely minimise any detrimental impacts from noise pollution. Thank you for considering this submission.

Simon Mellen

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