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MEMORANDUM

To: Ald. Robert Bauman
From: Christopher Hillard, Legislative & Fiscal Services Specialist-Lead
Date: 7/8/2025
Subject: Ultrasonic Pest Repellent Devices

What are Ultrasonic Pest Repellent Devices?

Ultrasonic pest repellent devices are tools that emit an ultrasonic sound that claim to repel, deter, (or possibly even kill) unwanted animals such as insects, rodents, birds and large mammals. These devices, and others related to them, can cover a wide range of the acoustic spectrum depending on the target species. However, ultrasonic sound is defined as sound above 18,000 hertz (Hz) or 18 kilohertz (kHz), generally considered the range above normal human hearing. Ultrasonic devices are typically marketed to target arthropod (including spiders, scorpions and insects) and mammal pests. These devices are often marketed as a cheaper, effortless, and more environmentally friendly alternative to traditional pest control methods like poison. Prices can vary widely from around $20 to multiple thousands of dollars. These devices have been marketed to consumers since the 1970s and their modern incarnations tend to be small and can be powered by batteries, conventional plugs or, in the case of some units intended for outdoor use, solar power.

Do Ultrasonic Pest Repellent Devices Work?

Evidence for the efficacy of these ultrasonic devices is thin and largely anecdotal. A 2015 meta-analysis done by the University of Arizona College of Agriculture and Life Sciences puts the academic consensus on these devices succinctly: "Many studies have tested the effectiveness of the sonic pest devices, most illustrating their ineffectiveness." The study goes on to say "commercially available sonic pest devices for use in residential applications have not been shown to be effective in scientific studies. For this reason, use of these devices is not advised to treat common pest problems. Although some researchers are developing sonic techniques that illustrate promise for very specific pests, these technologies are yet to be commercially available."

Furthermore, while some time has elapsed, the claims made by the industry selling these devices have not escaped the notice of the Federal Trade Commission (FTC). In 2001, more than 60 companies received warning letters from the FTC that “efficacy claims about those products must be supported by scientific evidence," and 2 years later, one company was sued by the FTC for violating its warning. Indeed, between 1985 and 1997, the FTC brought law enforcement actions against 6 companies that allegedly made false and unsubstantiated claims about the effectiveness of ultrasonic devices in controlling rodent and insect infestations. Each of those cases was resolved by consent order after the FTC challenged the manufactures on the following types of claims:

- Eliminates rodent infestations.
- Repels insects.
- Serves as an effective alternative to conventional pest-control products.
- Increases or assists the effectiveness of other pest-control methods.
- Eliminates fleas on dogs or cats.
- Scientific tests prove product effectiveness.

Complaints to the FTC aligned closely with what subsequent studies have largely found: that any reaction by rodents to ultrasound would be temporary at best because rodents become accustomed to ultrasound and return to their nesting or feeding areas even in the presence of an ultrasonic device.

Do Ultrasonic Pest Repellent Devices Affect Humans?

Similar to the efficacy of ultrasonic pest repellent devices, there is also a dearth of evidence when it comes to the impact of these devices on humans. A 2016 article from the *Proceeding of the Royal Society* by Professor T. G. Leighton, of the Institute of Sound and Vibration Research at the University of Southampton, summarized the state of research into the effect of ultrasonic frequencies on people as “so slim that few reports have progressed far along the sequence from anecdote to case study, to formal scientific controlled trials and epidemiological studies.” According to Prof. Leighton:

> “New measurements indicate that the public are being exposed, without their knowledge, to airborne ultrasound. Existing guidelines are insufficient for such exposures; the vast majority refers to occupational exposure only (where workers are aware of the exposure, can be monitored and can wear protection). Existing guidelines are based on an insufficient evidence base, most of which was collected over 40 years ago by researchers who themselves considered it insufficient to finalize guidelines.”

As part of his paper, Prof. Leighton recorded the background noise in a range of public locations including a busy and popular library, train station, swimming pool, museum and school, all chosen because people who had spent time in them had complained of ultrasonic sickness, which (anecdotally) includes symptoms like nausea, headache, fatigue, migraine and tinnitus. Ultrasonic frequencies were detected in all locations; however, as the author admits, it is difficult to draw any conclusions from this limited experiment, particularly given the ubiquity of devices that emit ultrasonic sound.

Prof. Leighton further goes on to say that this "lack of research means that it is not possible to prove or disprove public health risk or discomfort. Publication of this report comes at the cost of possibly raising anxiety and potentially promoting symptoms in individuals who had none. However, it is important that existing sufferers are able to identify the true cause of their symptoms, whether they result from [very high frequency/ultrasonic] exposure or not, and lack of research means that it is impossible to make such an identification of the source of the symptoms currently reported by members of the public. This paper highlights the knowledge gap in which ultrasonic sources are being placed in public spaces."

Finally, Prof. Leighton points out that the few guidelines that do exist (in this case in the UK, although similar guidelines also exist in the United States) are not only based on thin evidence, but also fail to take into account the significant variability in sensitivity to ultrasonic signals of individuals, or specific demographics within the population, compared to the 'average' on which the guidelines are based. According to the article, recent data suggest:

- 1 in 20 of people aged 40–49 years old have hearing thresholds that are at least 20 dB more sensitive at 20 kHz than the average 30–39 year old.
- 5% of the 5–19 year age group are reported to have a 20 kHz threshold that is 60 dB more sensitive than the median for the 30–39 year age group.

Detecting Ultrasonic Devices

If the City were to consider an ordinance relating to ultrasonic pest repellent devices, it would be necessary for the City to obtain equipment that could be used towards that end. Fortunately, there are a number of devices that are designed for just this purpose. Industries that use pressurized gas often employ ultrasonic leak detectors which are designed to find tiny flaws in piping where gas may be escaping and, thus, producing an ultrasonic frequency. These devices can also be used to detect an electronic ultrasonic device. Many have ranges of 20 feet or more and are designed to work in spaces

with ambient industrial noise. Prices can vary from under $100 to several thousand dollars, with the level of sensitivity generally dictating the price. Most pest repellent devices appear to emit a frequency somewhere between 20 and 65 kHz, occasionally going as high as 100 kHz. Most ultrasonic leak detectors appear to be able to detect and locate the source of frequencies between 20 and 90 kHz.

Challenges and Conclusions

One important challenge to keep in mind with regulating ultrasonic devices is proving where a noise is coming from. Ultrasonic devices tend to be small and discrete, and definitively locating one with a suitable detector would likely require stepping onto an individual's property, which, unlike measuring decibels from the property line, is far more challenging. Furthermore, as Prof. Leighton mentions in his article, the amount of ultrasonic noise has increased significantly in recent years, along with devices that deliberately emit these sounds like those designed for pests, others, such as certain public address systems and voice alarms emit these noises as byproducts.

To conclude, there is almost no evidence that ultrasonic pest repellent devices work, and the few studies that have looked into the matter seem to indicate that they do not. Similarly, there is a dearth of evidence when it comes to the impact of ultrasonic devices on humans. It is possible that deeper analysis, particularly studies that better take into account the natural variation in a population when it comes to hearing, may confirm some of the anecdotal reports of those who claim to have adverse effects from ultrasonic noise. However, as the state of research currently stands, nothing can be said definitely one way or the other. Finally, there are a number of commercially available detectors that could help locate ultrasonic pest repellent devices. However, the small size and discrete nature of these devices would likely require City officials to access private property, which makes enforcement much more difficult.

Please let me know if you need any additional information.

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