From: Steve Palmer <sepalmer@gmail.com>
Sent: Monday, November 13, 2017 2:39 PM
To: Sidney Hill
Subject: Comments on the Proposed Sandoval County Oil and Gas Ordinance (concerning noise)
Attachments: County Commission whitepaper.docx

Dear Mr. Hill,

I have attached are my comments on acceptable noise levels for consideration in the proposed Sandoval County Oil and Gas Ordinance by the County Commission Thursday, November 16, 2017.

Sincerely,

Stephen E. Palmer
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~ ~ *Life isn't about waiting for the storm to pass... It's about learning to dance in the rain*
(Vivian Greene)

Protecting Sandoval Residents from Excessive Noise due to Oil and Gas Extraction

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Excessive noise presents a growing danger to human health and welfare. This conclusion is based on scientific studies showing direct links between noise and various health problems, including:

1. noise-induced hearing loss,
2. speech and communication interference,
3. high blood pressure and cardiovascular disease,
4. sleep disruption,
5. stress related illnesses,
6. loss of productivity, and
7. annoyance.

I will only address the first two issues here – both auditory in nature – since they are the most studied and best understood problems. A brief treatment and discussion of the other effects on human health and well-being (#3 – 7) can be found in the Wikipedia entry on "Health effects from noise" (see https://en.wikipedia.org/wiki/Health_effects_from_noise). A recent study of the non-auditory noise effects specifically related to adverse health outcomes of unconventional oil and gas development can be found in Jake et al. (2016). Several further large-scale epidemiological studies have associated other sorts of environmental noise exposure with adverse non-auditory health outcomes, such as high blood pressure (Dratva et al., 2012), cardiovascular disease (Babisch et al., 2013), diabetes (Sørensen et al., 2013), adiposity (Christensen et al., 2015), birth outcomes (Gehring et al., 2014), cognitive impairment in children (Lercher et al., 2002), depression (Orban et al., 2015), and sleep disturbance (Hume et al., 2012). It is not yet known whether the noise associated with unconventional oil and gas development produces the same health problems, but there is currently no reason to supposed otherwise.

1. Noise-induced hearing loss

Nearly half of the US population with hearing impairments owe their losses to acute or chronic noise exposure (PHS, 1991).[1] The National Institute of Occupational Health and Safety (NIOSH) therefore surveyed the scientific evidence and recommended, as a "best practice guide," that industrial noise levels

[1] Noise-induced hearing loss is caused by the destruction of hair cells in the Organ of Corti within the cochlea of the inner ear. Hearing loss related to hair cell destruction is not reversible and cannot typically be restored by the use of a hearing aid.

not exceed 85 decibels (dB) for 8-hour work days on 5 days per week. Exposure to louder and/or more prolonged noise levels tends to cause permanent and irreversible hearing loss in most of the adult population (NIOSH, 1998).

It is important to notice three things about the NIOSH recommendation, which is specifically designed to protect adult workers in industrial settings.

First, it is not sufficient to prevent hearing loss in all industrial workers. NIOSH acknowledges that even noise at 85 dB for 8 hours per day and 5 days per week will cause significant hearing loss in about 8% of adults (https://blogs.cdc.gov/niosh-science-blog/2016/02/08/noise/). The risk of noise-induced hearing loss does not approach zero until exposure is reduced to approximately 80 dBA for 8 hours /day and 5 days/week (https://www.cdc.gov/niosh/programs/hlp/risks.html).

Second, this noise level will actually cause noise-induced hearing loss in a substantially larger percentage of children and adolescents, whose hearing is both more sensitive and more fragile than that of adults. NIOSH deemed the health consequences of 85 dB noise levels to be acceptable because their regulations were specifically aimed at protecting the bulk of adult industrial workers from noise-induced hearing loss. It will NOT protect the general population, which includes susceptible adults and children, and it will NOT protect anyone from continuous "24-7" noise at the 85 dB level (see below). The appropriate conclusion is that 85 dB for 8 hours/day and 5days/week is a substantial overestimate of the noise level to which the general population should be subjected without causing hearing loss. If more conservative levels are not specified, some adults – and even more children – will likely suffer permanent hearing disability from exposure to oil and gas drilling operations.

Third, and most importantly, the NIOSH standard assumes just 8 hours of exposure to 85 dB noise and that industrial workers will be exposed to much less noise during the other 16 hours per day and on the other 2 days per week. This is crucial, because the damaging effects of noise are determined not only by its intensity, but by its duration, with longer, more continuous noise causing more damage (EPA, 1974). Figure 1A shows a graph that represents the total amount of noise exposure allowed by NIOSH guidelines as the total area in red. Figure 1B shows the proposed maximum allowable noise for Sandoval's O&G Ordinance: 80 dB for 24 hours/day, 7 days/week, for up to 30 days. That would expose Sandoval residents to almost 3.8 times more total noise than the NIOSH standard, and with

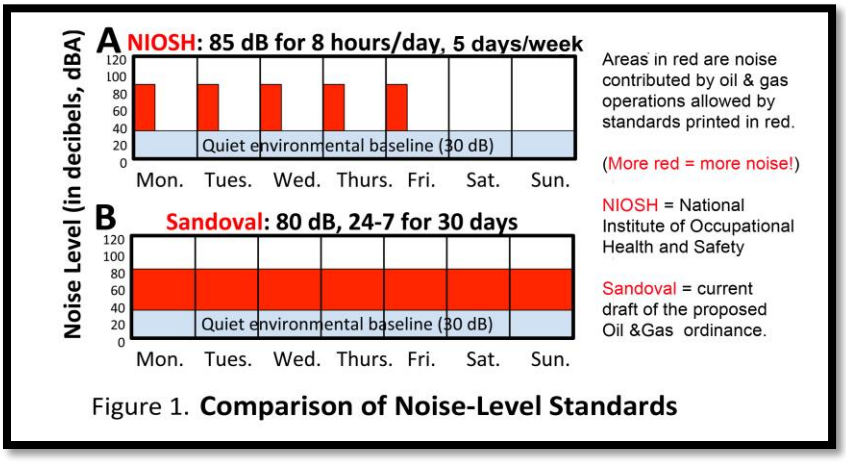

Figure 1. **Comparison of Noise-Level Standards**

zero hours of reduced noise during which the auditory system can recover from the intense, continuous noise produced from O&G drilling sites. If enacted as written, this noise policy would surely open Sandoval County to lawsuits over failure to protect its citizens from noise-induced hearing loss.

It is worth mentioning that it seems unreasonable to expose the residents of Sandoval County to anything like the same levels of noise exposure as those to which industrial workers might be exposed at or near the NIOSH standards. After all, oil and gas workers are being paid, at least in part, for their exposure to uncomfortable and potentially hazardous noise levels, whereas nearby residents of Sandoval County are not. Indeed, many of the citizens would be forced to endure their exposure to this noise against their wishes and without compensation.

Crucially for the current situation, there are existing recommendations for continuous 24-hour noise levels for the general public that have been determined and published by the Environmental Protection Agency (EPA, 1974). They specify a maximum of 70 dB, fully 10 dB lower than proposed in Sandoval's current draft ordinance. There is no convincing justification from the perspective of the health and well-being of Sandoval residents to exceed this recommendation, unless the drill site's hours of operation are limited, say, to an 8-hour work-day. That respite would give citizens' auditory systems time to recover from temporary damage produced by the loud noise emanating from the O&G drilling site, which (hopefully) would be sufficient to prevent permanent hearing loss. Permitting any noise level higher than 70 dB (at 750 feet) would benefit the oil and gas industry only at the expense of the health and well-being of Sandoval citizens.

I should add parenthetically that the statement of noise limits as written in the O&G ordinance will not actually keep people from being exposed to noise levels louder than 85 dB during their normal activities, at least as I understand the language of the ordinance. It states in Section 6.3 (Setback Requirements) that drilling sites must be at least 750 feet from "occupied dwellings, schools, churches, hospitals, or cemeteries" (referring specifically to the buildings rather than the properties on which they are situated) and in Section 5.6 (Noise Control Plan) that the noise levels cannot exceed the 80 dB limit "as measured from a distance of seven hundred fifty (750) feet from the well or associated operations." But those specifications will not necessarily protect children playing in the school's playground or baseball field nor homeowners gardening in their yards or patios from experiencing truly hazardous noise levels, if these activities take them closer than 750 feet from the O&G drilling site. A more protective regulation would specify that the drill site "not be located less than 750 feet from the *nearest property boundary* of any occupied dwellings, schools, churches, hospitals, or cemeteries outside an incorporated municipality in the County without the written consent of the owner of such occupied dwellings, businesses, schools or churches." As currently written, the ordinance would allow a drill site to be located just a few feet from the children's baseball field or the homeowner's garden, where noise levels could well reach deafening levels.

2. Communication Interference

In addition to permanent disability produced by noise-induced hearing loss, temporary – but potentially life threatening – problems can be caused by communication interference if your child or spouse failed to hear your call of alarm at some truly dangerous situation.

The EPA specifies difficulty in understanding speech at substantially lower levels than those that produce hearing loss. Communication interference refers to situations such as having to shout to members of your family in the same room of your own home or having to stand right next to have a conversation. Again, based on scientific evidence, the EPA has provided even quieter noise levels to enable understanding of normal speech: outdoor noise no greater than 55 dB and indoor noise no greater than 45 dB. In contrast, the Sandoval draft ordinance proposes noise levels up to 80 dB – 25 to 35 dB more than the EPA recommends – for a period of 30 days and up to 60 dB for the rest of the year.

Given that sound insulation approaching 10 dB is provided within the walls and (closed) windows and doors of most buildings, I believe that the best noise regulation for the Sandoval Oil and Gas Ordinance would be to restrict sound levels to be no greater than 70 dB for a maximum of 30 days and no greater than 55 dB for the rest of the calendar year, as measured at 750 feet from the nearest property boundary of any occupied building, without the written consent of the owner.

In closing, I ask each Commissioner to think about this: Is it fair or reasonable to ask the residents of Sandoval County to risk permanent hearing loss, to shout in their own homes and yards, and to jeopardize the well-being of themselves and their families just so that oil and gas companies can avoid the cost and/or inconvenience of effective noise reduction? If you imagine how you would feel if you yourself were subjected to these problems on a daily basis, I submit the only reasonable answer is a resounding “NO”.

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