



March 18, 2021

Ronald Clark, Chairman  
Madison Planning & Zoning Commission  
8 Campus Drive  
Madison, CT 06443.

RE: Initial review of submittal documents regarding 856 Boston Post Rd. Planned Development  
"The Ledges at Madison".

Dear Chairman Clark:

This firm performed an initial site plan examination for the proposed development that included documents downloaded from the Town of Madison website and stored in my firms ShareFile cloud folder on March 8, 2021. The scope of my study is primarily related to construction and blasting vibrations. The basis of my review is from the perspective of a Board Certified Senior Forensic Engineer, frequently working on cases and claims involving damages to properties from storms, construction vibrations, seismic events and blasting. Further, I served as the Town Engineer reviewing similar proposals and engaged in projects where there was significant blasting to install utilities, water lines, foundations and sports fields. Locally, I investigated a loss at the Madison historical society building after there was construction equipment that was used in close proximity to the structure.

A summary of the results follows:

**Wetland Related** – I reviewed the video testimony of the Applicant's blasting consultant given at the Wetlands Public Hearing. It is apparent the consultant has genuine enthusiasm in designing blasting programs which he believes may mitigate common damages from blasting vibrations. There is little planned blasting activity within the wetlands upland review area (URA) with the exception of the SW corner of the planned development. The following are omissions and potential activities within the wetlands URA identified during my review:

1. There is an approximate location of a water line that serves two other properties through the benefit of an easement. There is substantial planned activity within normal setback requirements for a potable water service including:
  - A. West of the Gateway Residence garage
  - B. SW corner of Garage service Estate Residence
  - C. The East side of the Garage and under the Carriage House Residence 2 structure
  - D. An undefined location between the Carriage House C garage and the planned stormwater infiltration system located at the SE corner of the property
  - E. Serving the Downes Residence (54 Quarry Ledge)
  - F. Serving the Farmer Residence (64 Quarry Ledge) and 23 Bushnell Lane
  - G. New septic system components and possible stormwater drainage infrastructure (both considered a Class 3 water that is grossly contaminated and can contain pathogenic, toxigenic, or other harmful agents. Such water may carry silt, organic matter, pesticides, heavy metals, regulated materials, or toxic organic substances. (ANSI/IICRC S500 Standard and Reference Guide for Professional Water Damage Restoration)



2. Given the unknown location of the water line serving the Downes and Farmer properties, it is likely that the planned activity will damage the line or violate setback requirements of the existing line and the proposed structures and infrastructure.
3. Prior experience with losses involving blasting include blasting to install septic tanks. I've had losses where the blasting exposed ledge and a septic tank, pump chamber was installed over the blasted ledge. Tanks were found leaking and traveling more than 200' and contaminated a neighboring well that was surprisingly located upgradient; proving that unseen networks of fractures in rock can result in unpredictable pathways. The fracture structure below grade is largely unknown and pollution impacts can occur if there is a seam exposed in the blasted rock. Carriage House Residence 2 has two systems with a septic and pump chamber tank installation near areas with suspected ledge.

**Planning and Zoning Related** – The Wetland Related comments above are important considerations that are within planning and zoning considerations as the proposed development will likely require relocation of the water service line that served the Downes and Farmer residences. The relocation of these lines must abide by current Health code requirements for setbacks. The water that flows into the catch basin located near the east side of CHR #2 will have deicing products and these products will accelerate the corrosion of the existing service line as well as potentially cause a problem with any new line that is installed if the infiltration area is near the water line. Some of the findings as it relates to the vibrations are as follows:

1. Locations of the water service line and the planned improvements on the subject lot need to be identified to assess the impacts to the water line as well as the proximity of the blasting to sensitive structures. Relocation of some or all of the service lines, buildings, septic system components, drainage and infiltration components is necessary to achieve safe setback requirements.
2. The type of water supply line serving the neighboring properties is unknown. The installation was likely installed when one of the Farmer properties was built in approximately 1910-1912. . Common water service line products at the time were cast iron with lead joints and no corrosion protection lining inside or on the outside of the pipe. The considerations given below will influence the location of the water service line for the adjoining properties and the need for blasting and construction vibration considerations. These considerations are likely to require the installation of a relocated pipe and/or moving proposed infrastructure and buildings. These issues also are likely to be addressed by the Civil Engineering review. The development and water service line location concerns are:
  - 1) Proximity to other improvements and utilities
  - 2) Potential for damage from blasting, construction activities and/or joint displacement. The transient and continuous vibrations will likely dislodge interior corrosion byproducts and cause blockages and interruption of the water being available to those currently being served by the line. Given the age of the line, while presently serviceable, the line is more fragile to disruption by vibrations and construction activities. There are a multitude of construction activities planned near the water service line.
  - 3) Serviceability and access to be able to repair.
  - 4) Potential to have increased salt corrosion due to deicing materials needed for the servicing of the parking areas and walkways. ASTM F2966 addresses the need for deicing and snow removal products to be used for the protection of owners and guests from slip and fall risks, the current standard of care for developments of this type. Deicing materials increase the rate of corrosion. Locations of the water supply lines may need to be modified to prevent accelerated deterioration if the over 100-year-old piping is cast iron or other vulnerable material.



3. Applicant's Blasting consultant touched on a number of technical variables needed to properly execute a blasting design to prevent offsite damage. The design should be made a condition of any permit and should be reviewed by a third party due to the location of sensitive structures nearby. The design would reflect the number of technical blast design variables but also would consider three key factors
  - 1) Building type and condition. The building types and conditions have not been identified and the fragile aspects of the buildings have not been identified. It is important for the commission to consider this as important to protect the nearby residents.
  - 2) Vibration source type (transient or continuous) Blasting would be transient, construction equipment is long term and considered continuous. **A separate plan would be needed for monitoring and controlling construction vibrations by an independent monitor not in the employ of the blasting contractor with the results and reports from the monitoring available to the public.**
  - 3) Importance factor of individual buildings. This consideration is primarily a decision of the planning and zoning commission after hearing testimony at the public hearing. The more important the buildings are then the greater the need to control the duration and resulting vibrations.
4. Properly designed blast plan that is independently monitored to minimize potential risks of damage. Considerations of reducing the blasting and construction vibration risks include:
  - 1) Reducing the footprint and proximity of blasting and construction vibrations close to existing sensitive structures and water lines.
  - 2) Well-designed and independently reviewed blasting design and monitoring program that is required to be filed with town staff so that it may be available to the public. This information is helpful when investigating a vibration complaint. Transparency is important as it provides greater incentive to adhere to the plan. I recommend the commission insist on having a well-documented blasting design, with a peer review by another blasting engineer expert, that addresses the concerns, as well as to suggest modifications to the plan to reduce the volume of blasting and the proximity of the construction to nearby structures.
  - 3) The threshold of transient vibrations (less than 1000 occurrences, each delay is an occurrence and creates a vibration response) from blasting be limited to the Swiss SN 640 312 standards of less than 0.30 in/sec for buildings with plaster walls. Continuous vibrations should be reduced to 0.12 in/sec where construction equipment will produce more than 1000 vibrations. If there are valuable art objects a vibration limit of 0.1 ips is considered minimally safe. Vibrations as low as 0.1 ips will still be perceived as annoying to the neighbors subjected to this level; however, it shouldn't result in damage. (Note: in/sec or ips is the current standard for assessing risks from construction/blasting vibrations, the value is measured at different frequencies, complicating the understanding of what this means. Most are familiar with wind related sounds creating a sound frequency that resonates a structure. The website <https://www.youtube.com/watch?v=j-zczJXSxnw> shows the Tacoma Narrows Bridge collapse caused by wind induced harmonic vibrations. Each structure has a different resonant frequency and responses to vibrations vary substantially, this provides the rationale for the Swiss SN 640 312 standard, it prescribes a lower limit to reduce the risks that the multitude of variables may provide and it is based on sound science )
  - 4) Have a third-party review of project specific construction bid package to ensure the blast design and monitoring is included.



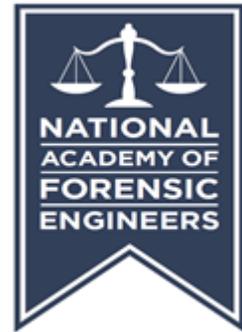
- 5) Pre-Construction and Pre-Blast Survey of surrounding structures that includes identifying the sensitivity of the property to vibrations as well as identifying and documenting pre-existing conditions.
- 6) Obtain daily field reports, photographs during the construction work

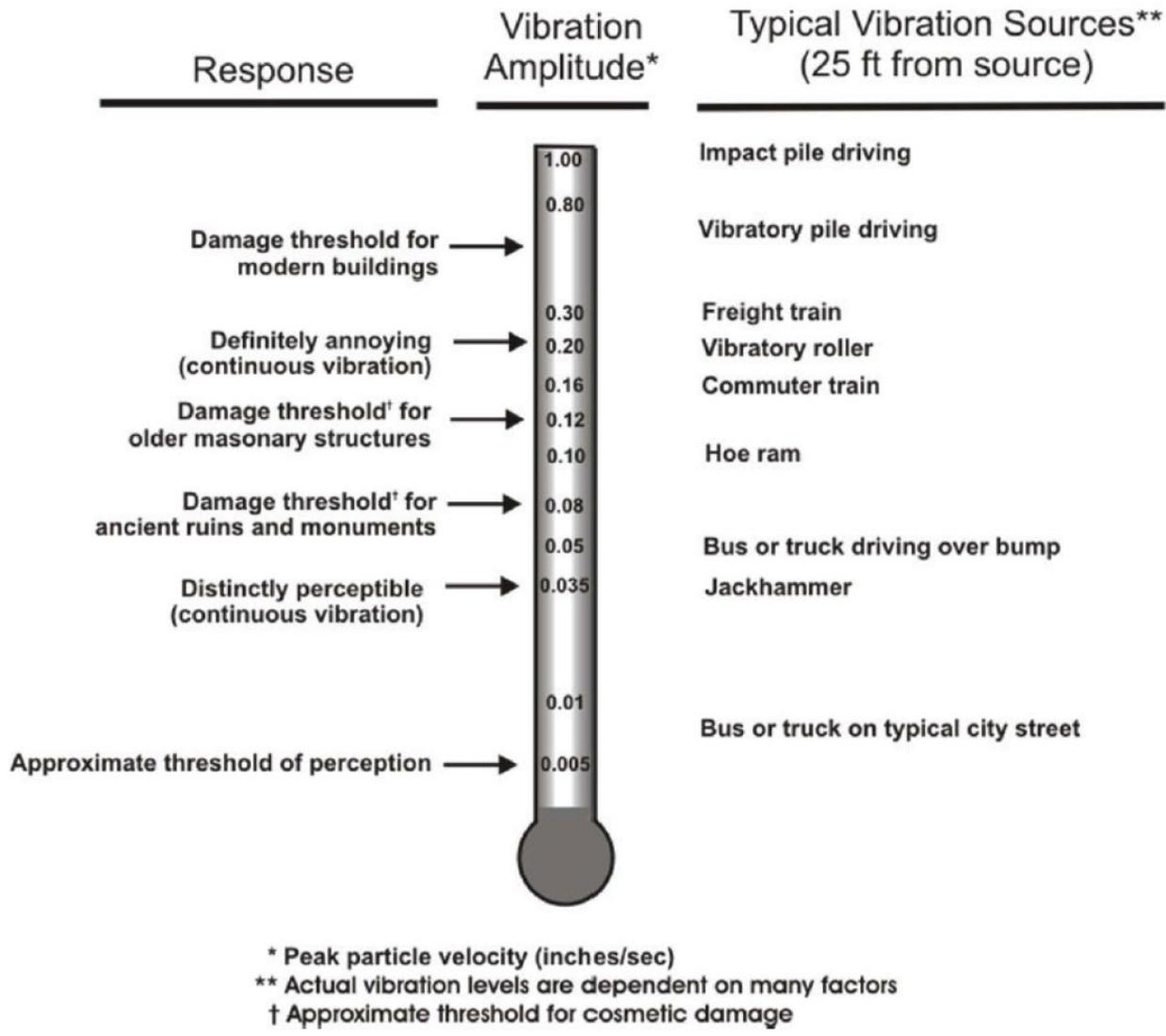
In closing my remarks, pre-blast/construction surveys of all vulnerable and nearby structures is essential. The results of the survey should also be available to the residents subjected to the pre-blast survey, thus maintaining their privacy but providing a measure of existing conditions and information needed by the blasting engineer in producing a blasting plan that is sensitive to the surrounding properties.

If you have any further questions, please advise.

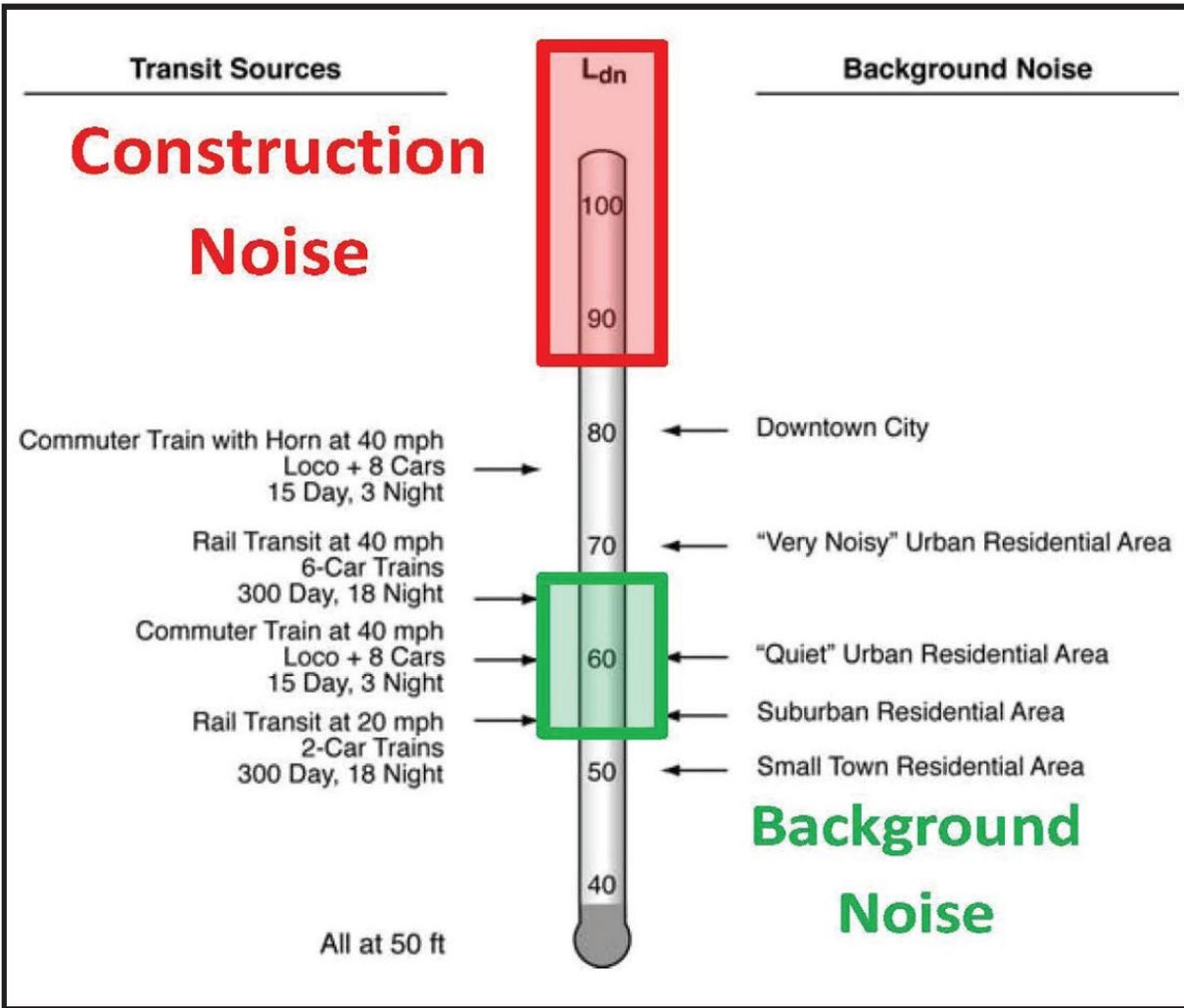
Sincerely,

Jeffery A. Cissell P.E.,  
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**Figure 8**  
 Vibration guidance from NCHRP 25-25 (Task 72)<sup>13</sup>.



**Figure 16**

Comparison of construction noise levels relative to ambient background levels<sup>17</sup>.



#### 19. VIBRATION MONITORING

Vibrations due to all construction activities including driving sheet piles will be monitored. The Contractor shall perform the work in a manner which will limit vibrations at the structure nearest to the work being performed to a maximum of 0.25 inch per second. Vibrations will be monitored by others at all structures, including buildings and pools. The Contractor will be informed when the vibrations from his operation have exceeded the 0.25 inch per second limit and the Contractor shall take immediate action to reduce the vibrations to acceptable limits. The Contractor shall give the [REDACTED] notice at least 15 days prior to beginning vibration-inducing construction operations, and shall coordinate the daily location of these operations with the government personnel at least 48-hours prior. The Contractor shall also be responsible for contacting the vibration monitoring firm to schedule the necessary vibration monitoring personnel.

Typical language for vibration monitoring when the limit is 0.25 ips. Consideration of a lower 0.12 ips particle velocity is recommended for the proposed project.