

III. NOISE IMPACTS

A. Proposed Findings of Fact Regarding Noise Impacts

146. Kenneth Kaliski has worked at Resource Systems Group (“RSG”), Inc. for 22 years. He is the Director of Resource System’s Group’s Environmental Services Division. Mr.

Kaliski holds a BA in Biology/Environmental Studies and a BE in Engineering. His professional licenses and certifications include a Professional Engineer License; he is Board Certified through the Institute of Noise Control Engineering; he is a Qualified Environmental Professional through the Institute of Professional Environmental Practice. (N.15)

147. Mr. Kaliski is a member of the Institute of Noise Control Engineering's Board Certification Exam Committee, responsible for administration of the national Board Certification Exam. (N.15)
148. Kaliski has been an expert witness in the past, testifying before all of Vermont's nine District Commissions, the Environmental Board, Public Service Board and Environmental Court. (N.15)
149. Kaliski has represented both applicants and opponents. (N.15)
150. Exhibit N.15 contains three resumes. Kaliski's CV/Resume is part of this exhibit, which has been admitted into evidence.
151. Kaliski has prepared a report in connection with his testimony. This report has been marked and admitted as Exhibit N.2/T.2. The following corrections need to be made to this report by Kaliski:

There was an error with respect to the numbering of figures in the report. The figure numbers are correct until page 17.

On page 17, what is identified as figure 10 should be figure 13.

On page 18, what is identified as figures 11 through 18 should be figures 14-21.

On page 23, what is identified as figure 19 should be figure 22.

152. There are no other corrections that need to be made aside from renumbering the figures.
153. Kaliski's prior work experience that is relative to the applicable issues in this appeal includes extensive experience with respect to quarry projects in Vermont. He has

testified on approximately a dozen quarry projects. Overall, he has been involved in over two dozen quarry projects. While most of his work has been for quarry developers, he has also worked with neighbors trying to protect their property interests from the adverse impacts which a quarry can create. The cases he has worked on include McLean, Alpine Stone, Pike (Williamstown) and Vermont Soapstone.

154. Kaliski is familiar with the Act 250 criteria that govern applications for quarries in Vermont, especially those criteria involving air and noise impacts from quarries. In this case, the relevant criteria regarding noise that Kaliski testified to are Criteria 8, 9(E) and 10.

155. Kaliski is familiar with the Moretown zoning regulations' noise review criteria that apply to the proposed quarry for Moretown. (N.2 page 1) These are specified in Article IV: General Regulations of its Zoning Standards. Section 4.10 B (1) States:

“No noise shall be permitted which is excessive at the property line or is incompatible with the reasonable use of the surrounding area. Excessive noise shall be considered a sound pressure level that exceeds 70 decibels at the property line on a regular or reoccurring basis.”

Section 5.2 C States:

“Conditional use approval shall be granted by the Development Review Board upon finding that the proposed development will not adversely affect the following:

...

(2) **The character of the area affected.** The Board shall consider the location, scale, type, density and intensity of use associated with the proposed development in relation to the character of the area likely to be affected, as defined by the Board based on the Moretown Town Plan, applicable zoning district purposes and standards, submitted materials, and testimony presented at public hearings.”

156. The Vermont Environmental Board has seen a number of cases dealing with quarry noise. (N.2 Page 1) The Board has used both 50 dBA Lmax (e.g. Ersosimo and McLean Enterprises) and 55 dBA Lmax (e.g. Pike Industries (Williamstown) and Alpine Stone) standards as measured at homes and in areas of frequent human use. In addition, the Board has applied a 70 dBA property line limit in some quarry projects (e.g. Barre Granite Quarries LLC and Pike Industries).
157. In considering these noise standards, all operational noise was generally considered, including trucks operated by the project and customer trucks accessing the project. Blasting noise has been generally covered separately by applying the U.S. Bureau of Mine airblast overpressure standards.
158. Lmax, as applied here, is the 1-second maximum sound level. In McLean, the Environmental Board required modeling to assume that each piece of equipment would generate their maximum sound levels at the same time.
159. The standard noise study procedure used by experts is comprised of two parts. The first is to determine what equipment will be used in the quarry and their maximum instantaneous sound levels. In this step, it is typical to use either published sound data or to conduct on-site testing to determine the maximum level. Note that the maximum level that is used is not an average, but the maximum 1 second level that is expected from the piece of equipment. The second part of the noise study is to take the maximum levels and conduct sound propagation modeling to determine the combined maximum sound level at receivers off of the project site. This is done using the ISO 9613-2 methodology implemented in computer programs such as Cadna A. (Testimony of Kaliski 12/17/2008)

160. Kaliski is familiar with the applications at issue in this proceeding and has reviewed the materials submitted by the applicant that are related to the operation of the quarry and its noise and air impacts. He is also familiar with the location of the proposed quarry, having visited the proposed quarry site and neighboring properties and conducted investigations there. (N.2)
161. Kaliski conducted investigations at the proposed site in July 2004 and September 2007. He also inspected the neighboring properties during July of 2004 and conducted sound monitoring. He conducted a review of Applicant's noise study. (N-2)
162. Kaliski testified that the Applicant's noise study failed to consider many important noise-generating components of the quarry and was deficient in many other respects. (N-2)
163. Kaliski reviewed Tech Environmental's Environmental Noise Assessment for the proposed Rivers Stone Quarry in Moretown, Vermont, dated October 4, 2005 and the applicant's November 28, 2007 discovery response. His review included supporting documentation and electronic files provided by the Applicant's consultant subsequent to that time. Kaliski's revised modeling corrects errors and omissions in the Applicant's modeling. (N-2)
164. Kaliski's revised modeling shows that the project impacts will exceed the Moretown Zoning Ordinance noise standards and Environmental Board noise standard precedents. (N-2)
165. The Tech Environmental report describes some of the model settings, but not all. The additional, undescribed settings used by Tech Environmental include (N-2 page 2):

Noise from the drill attenuated in Phase I Initial and Phase 6 by reducing the sound power level of drill rather than by construction of a barrier.

Dense foliage starting from the edge of the quarry and extending outward.
No reflection.
A ground factor of 0 on the quarry floor and 1 elsewhere.

166. ISO standards are industry accepted international standards for measuring noise levels (among other things not relevant here). Mr. Kaliski provided credible testimony regarding the proper ISO standards to use in computer models of projected noise levels from the proposed quarry.
167. Regarding errors or omissions in the Applicant's noise study, Kaliski had several areas of disagreement which formed the basis for his revised modeling runs. These differences result in an increase in noise at several residences to levels that are over the standards cited above. (N-2 Pages 2-4)
168. The sound power level of 115 dBA provided by the Applicant for the crusher/screening system is incorrect. The Applicant has stated that it may use, and purported to model the noise of, a Pegson1000 MaxTrak crusher with screens. However, the sound pressure levels given by Tech Environmental in subsequent submittals are for a Powerscreen unit. Powerscreen makes portable screens, not crushers. Powerscreen is a portable screener that sorts gravel or crushed rock into sizes. Rivers didn't model the equipment it proposes to use. (N-2 Pages 2-3)
169. Kaliski states that during the February hearing, Applicant's noise expert Guldberg was in error regarding his calculation. The supporting materials that the Applicant provided in their November 28, 2007 discovery response indicate that the calculation of sound power from another crusher/screener combination was done incorrectly, in that the crusher/screener was modeled as a single point source of noise, rather than as a long rectangular noise source generating noise in an "envelope" along its length in accordance

with the applicable ISO standard: ANSI S12.56-1999/ISO 3746:1995 “Acoustics – Determination of sound power levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane.” The measurement surface area was therefore calculated incorrectly leading to an underestimation of the sound power of the crusher/screener. (N-2 Pages 2-3)

170. Kaliski’s measurements of the crusher/screener were made of an actual unit in operation in accordance with the proper standard: ANSI S12.56-1999/ISO 3746:1995 “Acoustics – Determination of sound power levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane,” and reported the Lmax sound level. Kaliski corrected the Applicant’s noise calculation for the crusher/screener and when he did, he found that the Tech Environmental report underestimated crusher noise by over 9 dBA. The noise emissions were measured from a Pegson 1000 Maxtrak cone crusher with a Pegson Premiertrak 26X44 jaw crusher (the same combination shown in the Applicant’s “Information Request 3,” admitted at trial as Exhibit R-17) at a sound power level of 124.2 dBA, while the Applicant gave the erroneous level of 115 dBA. (N-2 Page 3)
171. The Tech Environmental report assumes foliage from the quarry edge outward. During Kaliski’s site visit on July 20, 2004, he observed a clear line of sight through the woods from the edge of the Phase I quarry to the property line. Therefore, modeling property line receptors as if there is 200 feet of dense foliage between the property line and the quarry is inappropriate. (Testimony of Kaliski 12/17/2008)

172. The Applicant's unwarranted assumption of dense foliage from the quarry edge outward produces a lower estimated sound level at the property line. Kaliski's revised noise modeling corrects this error. (N-2)
173. While the Tech Environmental noise report (R-9 Page 10) states that the drill was always placed at the highest point of the quarry phase, this is often not the case. In half the phases, the drill is placed well below the highest point, inside the quarry pit. For example, in Phase 1, the drill is placed 21 feet below surface grade.
174. By failing to model the drill at the highest point in all phases, Rivers has not modeled a worst case scenario and underestimates the noise that would be generated by the proposed quarry. (N-2 Page 3)
175. Whenever the equipment is below surface grade, there will be steep quarry walls directly behind these pieces of equipment. The drill is inside the quarry walls in Phases 1, 3, and 6.
176. Tech Environmental did not model the steep quarry walls as reflective surfaces, although the hard stone quarry walls would be reflective surfaces as to sound. (N-2 Page 3)
177. Figures 1 through 3 on pages 4-5 of Kaliski's report (N-2) show a three-dimensional view of the drill and other sources. There are steep quarry walls directly behind these pieces of equipment. The steep quarry walls are directed toward the neighbors to the east. The Applicant failed to model the steep quarry walls behind the equipment as reflective surfaces. This failure to model reflective quarry walls underestimates sound levels for neighbors opposite the quarry.
178. The Applicant's noise model, contrary to Kaliski's model and the precedent set by the former Environmental Board, does not include any customer trucks, on the haul road or

anywhere else. Customer trucks will make significant noise and should be included in the noise study. (R-9)

179. The Applicant modeled a blast as emanating from near the center of the quarry. This is not the worst-case location—especially when considering property line impacts. (N-2 Page 3)
180. The worst-case blast location, with respect to the Town standard, would be closer to the edge of the quarry and closer to its nearest neighbor. (N-2 and Testimony of Kaliski)
181. The Town standard does not exempt blast noise and is applicable at the property lines. The worst case blast location for the Holden property would be approximately 500 feet closer to the Holden property line than the location modeled by the Applicant. (N-2 and Testimony of Kaliski)
182. The Applicant's modeling of the kit-of-parts drill barrier is not done according to the ISO 9613-2 standard. (N-2 Page 3) According to this standard, the attenuation due to a barrier is a function of:
 - a) The frequency of the sound,
 - b) The relative height of the barrier,
 - c) The distance between the barrier and the source,
 - d) The distance between the barrier and the receiver, and
 - e) The ground attenuation on the receiver side of the barrier.
183. Instead of using the industry accepted ISO 9613-2 standard, the Applicant's consultant used one set of frequency dependent sound level reductions for every receiver in the model. That is, they reduce the sound power level of the drill to account for a theoretical barrier prior to conducting the propagation modeling. This method is not conservative, as

it gives every receiver approximately the same sound reduction – even those receivers that do not have the line of sight blocked by the wall. In other words, the drill will be noisier than the Applicant predicts because some locations will not be protected by the kit-of-parts drill barrier and some locations will have lower levels of attenuation than that suggested by the Applicant. (Testimony of Kaliski 12/17/2008 & N-2)

184. Kaliski's model corrected for all the Applicant's mistakes by using correct assumptions and applying ISO standards based on the Applicant's operating plan. The correct assumptions are(N-2 Page 6):

The quarry is operating towards the end of Phase I.

The drill, excavator, loader, crusher, and site truck are modeled at the same locations as in the Applicant's modeling for the indicated phase.

A 26-foot-wide by 13-foot-high barrier is placed in front of the drill.

The steep quarry walls are modeled as reflective.

The crusher is modeled with a sound power of 124.2 dBA. All other equipment is modeled with sound powers identical to the Applicant's assumptions.

Foliage near the property line is reduced as it does not meet the definition of "dense" as defined by ISO 9613-2. That is, one can clearly see the property line from the edge of the proposed quarry, even in July.

A customer truck is modeled on the access road.

185. Figure 4 of Kaliski's report (N-2) shows the extent of the modeling area with labels on each of the discrete receivers. Figure 5 through 7 of Kaliski's report show the result of the modeling assuming three different locations of a customer dump truck on the proposed access road: near the entrance from Route 100B, in the middle, and near the quarry. As shown, depending on the location of the truck, sound levels exceed 55 dBA at the Holden, McMullin, and Byrne/Farley receivers. Sound levels exceed 50 dBA at Hendrickson receiver. Figure 8 shows the same modeling assumptions as in Figure 7, but

with no barrier in front of the drill. Note that sound levels increase by a few decibels. Sound levels at the Hendrickson receiver increase to 55 dBA and at the Holden receiver increases to 59 dBA.

186. Figures 9 and 10 of Kaliski's report (N-2) illustrate the contribution just trucks along the access road make to the overall sound level. With two customer trucks operating near the entrance to the site, and nothing else in the quarry operating (Figure 9), sound levels at Byrne/Farley Residence reach 65 dBA and at McMullin Residence reach 62 dBA. With two trucks passing closer to the quarry, the sound level reaches 57 dBA at the Holden residence. During peak hours and peak days of operations, multiple customer trucks on the quarry site at once will be a frequent occurrence. [place holder: cite to traffic data]
187. Figure 11 of Kaliski's report (N-2) shows the sound levels from a blast in Phase 6. As shown, sound levels at the Project's property line exceed 70 dBA. This model run is identical to the Applicant's blast model, except the location of the blast is moved closer to the property line.
188. When the errors and omissions in the Applicant's noise model are corrected, the maximum sound level from operational sources is shown to exceed 50 dBA and 55 dBA at homes and areas of frequent human use, and blast noise exceeds the town zoning standard of 70 dBA at the Project's property line. As the perceived loudness of a noise doubles for every increase of ten decibels, the perceived noise from the quarry with customer trucks included would be double the 55 dBA standard and well more than double the 50 dBA standard at the Byrne/Farley and McMullin residences. ((Testimony of Kaliski 12/17/2008 and N-2))
189. The excavator assumed by the Applicant's consultant (and in RSG's modeling) has a bucket attachment. If a hoe ram (hydraulic rock hammer) was attached, the sound level

would be significantly higher. A hoe ram is used to break apart large rocks without blasting them. (N.2)

190. The applicant has not stated how it intends to cope with rocks too large for his equipment to handle, except to state that it does not intend to blast them. (Cross exam of Rath 12/15/2008))
191. The Applicant did not model the noise impacts from the haul road improvement, sight line clearing, or creating of the quarry staging area. These activities are not exempted from the noise level limits in the Moretown Zoning Regulations. (MZR § 3.5(A) (“The removal of soil, sand, rock, stone or gravel, **except when incidental to the construction of a building on the same premises**, may be permitted in designated zoning districts subject to conditional use review in accordance with Section 5.2 and findings that the proposed activity meets the standards below in addition to any other applicable standards contained in these regulations.”). (Bold added for emphasis)
192. Kaliski’s company, RSG, conducted sound propagation modeling for certain construction activities at the proposed Rivers quarry in Moretown. RSG used the CadnaA model with the following parameters (N-2 Page15) :

The modeling included one excavator, one loader, and one drill in the vicinity of the ledge removal along VT 100B.

The excavator sound power level is 116.5 dBA, the loader sound power level is 111.5 dBA, and the drill sound power level is 127.1 dBA. These are the same sound power level the Applicant uses for its equipment.

The modeling included a truck placed on the access road 175 meters from VT 100B with a sound power level of 109.3 dBA for the exhaust noise and 113.6 dBA for the tire/engine noise.

Spectral ground attenuation is used with default ISO 9613-2 conditions.

A crusher was not included since the Applicant has not stated where it would be placed during the construction phase.

Tree-clearing equipment was not included since the drilling would take place only after trees have been cleared. RSG assumed that tree-clearing equipment would be used during the construction of the haul road and sight-distance improvements.

193. The RSG noise model for construction activities (Figure 12 in N-2 Page 16) shows that 70 dBA is exceeded at the McMullin Field receiver. At this receiver, 73 dBA is from the drill alone. At the McMullin and Byrne/Farley homes, 65 dBA is from the drill alone. In addition, the Holden and Hendrickson residences have sound levels from construction that exceed 50 dBA. The modeling indicates that a level of 70 dBA is exceeded outside of the Applicant property due to construction-related noise. The noise from construction will exceed 55 dBA at two homes and 50 dBA at two additional homes.
194. Figure 12 of Kaliski's report (N-2 Page 16) shows model results assuming one excavator loader and a drill doing ledge removal and a truck on the proposed access road 175 meters from VT 100B. Areas exceeding 70 dB are shown colored gray and specific receivers exceeding 70 dB are colored in red. These receivers include the McMullin Field and McMullin and Burn/Farley homes.
195. Background noise has been taken into account in the RSG noise model: background sound level monitoring was completed on Monday, July 12th, 2004 for eight short-term monitoring stations. One long-term station was also established to record 1-hour Leq's, Lmax's, and Lmin's. Figure 13 [10] identifies the monitoring locations relative to the proposed quarry. (N-2 Pages 17-24)
196. The background monitoring station locations were chosen in an effort to describe the ambient noise experienced at various nearby residential homes. The geographic spread

was to understand the variations in the local ambient noise. (Testimony of Kaliski 12/17/2008)

197. The biggest source of background noise is VT Route 100B. As an observer moves further from this source of noise, other sources of noise become more perceptible. Airplane over flights, lawnmowers, and dogs barking would also be perceived as loud noise sources at Stations 1 (Dansker residence), 6 (Sharpwolf residence), and 7 and 8 (Larocca residence). (Testimony of Kaliski 12/17/2008 and N-2 Pages 17-24)
198. Mr. Kaliski did not observe any industrial-type noise that is currently in this area. (Testimony of Kaliski 12/17/2008)
199. Figures 14-21 [11-18] show the second-by-second sound level monitored at the various residences. At Dansker, sound levels range from 38 dBA to 50 dBA with an equivalent average of 41 dBA. Dansker is located along Stevens Brook Road, so is less affected by traffic noise along VT 100B. (N-2 Pages 18-24)
200. On page 19 of the RSG report (N-2), the background sound levels at Sainsbury and Sanders are shown. While the 90th percentile sound levels are low—43 and 42 dBA, respectively—the average levels are higher due to traffic along VT 100 B.
201. On page 20 of the RSG report (N-2), at McMullen and Hendrickson, who are located closer to the river, the 90th percentile sound level is 39 dBA to 40 dBA, while the equivalent average sound level is 47 dBA. There is some impact of traffic noise, but the maximum levels are much lower than that seen on the graphs on the previous page.
202. On page 21 of the RSG report (N-2), RSG provides measurements for two homes (Sharpwolf and LaRocca) located on the opposite side of the valley closer to the Moretown Common Road. The sound levels here are quite a bit lower, with 90th

- percentile sound levels reaching to 28 to 35 dBA and average sound levels at 35 to 41 dBA.
203. The 90th percentile level is that exceeded 90% of the time. Another way of putting it is that the quietest 10% of noise levels are under this level.
204. A long-term monitoring station was established at the property line near the Holden residence for a 38-hour period. As shown on the Figure on page 19 of the RSG report (N-2), the pattern shows a rise and fall with the day and night hours, respectively. The average Laeq during the daytime (defined here as 7:00 am to 9:00 pm) was just above 42 dBA.
205. A sound is generally considered audible if it meets or exceeds the background level. If it meets the background level, the sound would raise the background level by 3 dB. For example, if the background sound level is 40 dB and another sound source generates 40 dB at the same location, the combined sound level would be 43 dB. For such sounds of nearly equal level, audibility analysis becomes complex and involves an analysis of the different ways in which sounds mask each other. (Testimony of Kaliski 12/17/2008 and N-2 Page 23)
206. A sound source could be audible at even lower levels than the background noise level if the spectral content is significantly different from the background. For example, backup alarms are very audible even at low levels because they exhibit a pure tone at approximately 1,110 Hz. (Testimony of Kaliski 12/17/2008 and N-2 Page 23)
207. Table 1 on page 24 of the RSG report (N-2) compares the results of the modeling with background sound levels collected at each monitoring location. At all but the Dansker residence, the sound levels from construction and/or operational noise sources will be

above the 90th percentile background sound level. In some cases, the sound levels from the quarry will exceed the background levels by more than 10 dBA. For example, maximum quarry sound levels at McMullin (+12 dBA), Sharpwolf (+10 dBA), LaRocca (+11 dBA), and Holden (+14 dBA) all exceed the existing background levels by more than 10 dBA. It is therefore clear that the project sources will be clearly audible to many of the quarry neighbors.

208. The perceived loudness of a source approximately doubles for every 10 dB increase. (Testimony of Kaliski 12/17/2008 and N-2 Page 23))
209. At the McMullin horse farm, the maximum operational sound levels will be greater than the existing Leq by 12 dBA, meaning that the quarry will be perceived as more than twice as loud as the existing sounds. (Testimony of Kaliski 12/17/2008 and N-2 Pages 23-24)
210. Kaliski was present when Mr. Guldberg gave his testimony in February and he heard him describe the noise from an Atlas Copco Drill, including Guldberg's statement that ISO 4872 is an Lmax (maximum) sound power level. ISO 4872 is, however, a standard that defines how to measure and report average sound power levels for construction equipment intended for outdoor use.
211. The ISO 4872 standard sets forth measurement techniques and calculation procedures. Section 7.6 of the standard describes how the measurements are made and says, "When the fluctuations of the indicating pointer on the meter are less than plus or minus 3 dB, the noise is considered to be steady for the purposes of this International Standard and the level is taken to be the average of the maximum and minimum levels during the period of observation. If the meter fluctuations during the period of observation are greater than

plus or minus 3 dB, time-averaging is necessary to determine the sound pressure level on an energy basis” (emphasis added). In Section 8.1 of the 4872 ISO standard, “Calculation of surface sound pressure level,” the standard again shows that the sound levels from all the measurement locations are averaged. Then in Section 8.2, this same average is used to calculate the sound power level of the equipment.

212. Therefore, it is clear that measurement of the sound power of any machine, such as a drill, using the ISO 4872 standard reports an average sound power level rather than a maximum sound power level. (Testimony of Kaliski 12/17/2008)
213. ISO 4872 is intended to measure the average sound power level (“Leq”). It is Kaliski’s opinion that when Guldberg was testifying about the maximum sound levels for the Copco drill, he was really using average sound levels and therefore repeatedly understated the noise impacts of the drill. (Testimony of Kaliski 12/17/2008)
214. The Environmental Board has consistently used the Lmax to measure against the standard. The Leq or equivalent average sound level is always less than the Lmax. In a drill, the highest sound levels occur at the beginning of the drilling cycle when the bit hits the rock, and then declines as the drill steel sinks into the hole. Therefore, the Lmax would be higher than the Leq during a drilling cycle. (Testimony of Kaliski 12/17/2008)
215. Engine compression brakes are brakes that use the compression air in fuel-starved engine cylinders to slow a vehicle. A common brand of engine compression brake is made by Jacobs Vehicle Systems and often referred to as “Jake Brakes.” (Testimony of Kaliski 12/17/2008)
216. In Kaliski’s experience doing noise impact analyses for quarries, heavy trucks such as the ones that will be hauling stone out of the quarry (i.e., the customer trucks that Rivers

failed to include in its noise model) will likely be equipped with engine compression brakes. (Testimony of Kaliski 12/17/2008)

217. During his testimony, Mr. Guldburg responded to the Court's question regarding jake brakes by stating that many heavy trucks have jake brakes, but that jake brakes don't increase the trucks' noise. Engine compression brakes may or may not increase the sound level from a truck near to the vehicle, especially compared with down-shifting. However, the low frequency content of the truck noise does increase. Since low frequencies are not absorbed by the atmosphere and diffract more over barriers than higher frequencies, at a distance, engine compression brakes can be more noticeable and have a higher sound level.
218. In the Pike, Lathrop, and Barre Granite cases, Mr. Kaliski's company, Resource Systems Group, conducted studies evaluating the impacts of engine compression brakes at neighboring residences. It is certainly worth evaluating whether or not from the neighbors' homes, trucks coming down the haul road with engine compression brakes will be louder than trucks without them coming downhill. The applicant failed to do this analysis, or indeed any analysis at all of the noise impacts from the customer trucks accessing the quarry. (Testimony of Kaliski 12/17/2008)
219. Tech Environmental should have evaluated engine compression noise, especially with the steep grade. Many of the noise sources from the quarry do not currently exist in this area, including noise from material handling, crushing, drilling, backup alarms, and blasting. The noises associated with the Project will be clearly audible and out of character with the surrounding area and as a result will have an adverse impact on the area.

220. The project as proposed exceeds the 50 dBA/55 dBA standard for undue adverse impact established by the Environmental Board and the 70 dB property line standard established under the zoning ordinance. (Testimony of Kaliski 12/17/2008)
221. It is Mr. Kaliski's professional opinion that the proposed quarry project does not meet the requirements for the granting of a municipal conditional use permit or an Act 250 land use permit. (Testimony of Kaliski 12/17/2008)
222. On cross-examination, Rivers' noise expert, Mr. Guldberg, could not support many of the assertions and assumptions in his noise report, as noted below.
223. The Tech Environmental noise analysis used 55 dBA as the applicable noise at nearby residences and areas of frequent use.
224. The Vermont Environmental Board has also used 50 dBA as the applicable standard.
225. Tech Environmental's noise expert, Peter Guldberg, could not provide his rationale for using a 55 dBA standard instead of a 50 dBA standard.
226. If sound power is underestimated then the sound pressure value at neighboring properties will be correspondingly lower.
227. With respect to the modeling of the crusher noise, Tech Environmental took sound pressure readings at various points around the crusher.
228. Tech Environmental used the formula "sound power = sound pressure + 10 X log area/1" to calculate sound power from sound pressure.
229. Tech Environmental calculated the area in the above formula by drawing a circle around a point, with the point in the middle representing crusher.
230. The crusher modeled by Tech Environmental is an eighty-foot long rectangle.

231. A line drawn around the rectangular sound source at a given constant distance should be a rectangle, and not a circle.
232. By drawing a circle around a point instead of a rectangle around a crusher, Tech Environmental underestimated the area to be used in the sound power/sound pressure formula.
233. Tech Environmental therefore repeatedly underestimated the crusher's sound power level at each location by failing to model the crusher in accordance with the applicable ISO standard: ANSI S12.56-1999/ISO 3746:1995 "Acoustics – Determination of sound power levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane," and in turn underestimated the sound pressure level at Rivers' property line and at the neighbors' property and houses.
234. Tech Environmental did not model the noise from trucks using the proposed quarry access road.
235. The trucks Tech Environmental failed to model include the customer trucks that would be engaged in the daily hauling of crushed stone from the proposed quarry.
236. Tech Environmental placed noise monitoring devices on the neighbors' property lines in easy to access locations close to roads in order to measure ambient sound levels.
237. Those noise monitoring devices were not located at any homes or areas of frequent human use of the surrounding neighbors and were often located a substantial distance away from homes and frequent use areas and close to existing noise sources like roads, thus picking up more ambient noise than exists at the homes and areas of frequent use.

238. Because the noise monitoring devices were closer to the road than the neighbors' homes, the ambient noise background levels Tech Environmental recorded are not necessarily the same as that which would be recorded at the neighbors' homes.
239. Tech Environmental included in its report a measurement of the noise of a truck being loaded with crushed stone.
240. The noise level used in Tech Environmental's report with respect to the dumping of crushed rock into dump trucks relies upon a single measurement, taken on October 20, 2000 that lasted for 24 seconds.
241. Tech Environmental modeled blast noise by assuming that all the blasts take place at the quarry's acoustic centroid.
242. All the blasts for this quarry will not take place at the quarry's acoustic centroid.
243. As each blast moves closer to a receiver the noise level rises as perceived by the receiver in comparison to the noise level from a blast at the acoustic centroid.
244. Conversely, as each blast moves farther away from a receiver the noise level falls as perceived by the receiver in comparison to the noise level from a blast at the acoustic centroid.
245. To accurately describe the noise from blasting as it will be experienced by the neighbors, it is necessary to model the actual locations where the blasting will occur, and not simply rely on the centroid location.
246. A sudden sharp noise such as a blast is experienced by the human ear as an instantaneous noise.
247. There are proposed blast locations near the quarry's edge which will result in sound pressure level in excess of 70 dBA at the property line.

248. Tech Environmental's noise report fails to evaluate the noise impacts which will result from the construction of the quarry haul road.

249. Tech Environmental's noise report fails to evaluate the noise impacts which will result from the creation of the site distance at the haul road's intersection with Route 100B.

B. Proposed Conclusions of Law Regarding Noise Impacts

Under Criterion 8, the Court must find that the Quarry will not have an undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites or rare or irreplaceable natural areas.

The burden of proof under Criterion 8 is on those who oppose the Quarry, but Rivers must provide sufficient information for the Court to make affirmative findings. This means that, while the Neighbors have the burden of persuasion as to Criterion 8, Rivers must first meet its initial burden of production. Unlike Criterion 5, a project may be denied under Criterion 8, such as the proposed quarry in the McLean decision, pursuant to the Quechee Lakes analysis.

Since 1985, the standard of review under Criterion 8 has been based upon the Quechee Lakes decision. In Re: Quechee Lakes Corporation, #3W0411-EB and #3W0439-EB, Findings of Fact, Conclusions of Law, and Order (Nov. 4, 1985), the former Environmental Board articulated a "process" for determining whether a project will have an undue adverse effect on aesthetics. Quechee Lakes at 17.⁸ Since the issuance of Quechee Lakes the "process" set forth therein has become the most discussed and well known portion of any Act 250 decision in the thirty-six year history of Act 250.

⁸ In Quechee Lakes, the Board quoted from Re: Brattleboro Chalet Motor Lodge, Inc., #4C0581-EB (Oct. 17, 1984) in reference to the terminology of Criterion 8, but then stated that the definition of terms "does not identify the process which we believe appropriate in applying this terminology to specific projects."

In applying the now famous Quechee Lakes test, there can sometimes be a tendency to repeat the test in a rote manner, thereby missing the key Act 250 values which the Environmental Board sought to protect when it announced the test in Quechee Lakes:

In judging the impact of a proposed project on the values described in Criterion 8, the cornerstone is the question: Will the proposed project be in harmony with its surroundings--will it "fit" the context within which it will be located? Several specific features must be evaluated in answering this question:

- 1) What is the nature of the project's surroundings? Is the project to be located in an urban, suburban, village, rural or recreational resort area? What land uses presently exist? What is the topography like? What structures exist in the area? What vegetation is prevalent? Does the area have particular scenic values?
- 2) Is the project's design compatible with its surroundings? Is the architectural style of the buildings compatible with other buildings in the area? Is the scale of the project appropriate to its surroundings? Is the mass of structures proposed for the site consistent with land use and density patterns in the vicinity?
- 3) Are the colors and materials selected for the project suitable for the context within which the project will be located?
- 4) Where can the project be seen from? Will the project be in the viewer's foreground, middleground or background? Is the viewer likely to be stationary so that the view is of long duration, or will the viewer be moving quickly by the site so that the length of view is short?
- 5) What is the project's impact on open space in the area? Will it maintain existing open areas, or will it contribute to a loss of open space?

All of these factors must be weighed collectively in deciding whether the proposed project is in harmony with--i.e., "fits" --its surroundings. **The land uses which surround a project are crucial to the analysis.**

Quechee Lakes at 18. (Bold added)

There is a fundamental incompatibility between the existing rural, residential, and equine land uses and the proposed Quarry. Given this fundamental incompatibility (which perhaps only Rivers would deny), the fundamental question has to be whether the Quarry can be integrated into the existing rural, residential, and equine land uses without risk of harm to the Neighbors. The evidence clearly demonstrates that the Quarry cannot achieve this performance standard.

Moreover, Rivers proposes to impose upon the Neighbors a substantial and unreasonable interference with their use and enjoyment of their property, notwithstanding that Rivers could make a substantial return on his property by developing it for residential purposes. This is not a situation where homeowners have come to a nuisance. This is not a situation where homeowners bought property next to a quarry, and now oppose its expansion. Rather, this case is solely about whether the Quarry should be imposed upon an existing community.

In Vermont, we once relied upon common law nuisance and trespass to protect a person's property rights from surrounding land uses that were harmful. One key question in the nuisance analysis is whether a person came to the nuisance, or whether the nuisance came to the complaining property owner.

Vermont now relies upon its environmental laws to balance the competing rights of adjoining property owners, and Act 250 is the center-piece of Vermont's environmental laws. Yet, it is the law of Criterion 8 as set forth by the Board in Quechee Lakes that those competing property rights must be evaluated in light of the question: "*what is the existing land use pattern?*" In this regard, it is fair and appropriate for the Court to put the onus on Rivers to show that the Quarry will not harm the Neighbors, and their homes and businesses, all of which pre-date this proposed Quarry by many, many, years.

Criterion 8 (Scenic and Natural Beauty and Aesthetics) - Preliminary Legal Issue as to Noise

Noise is evaluated under Criterion 8 using the Quechee Lakes analysis to determine whether a project will have an undue adverse effect on the scenic or natural beauty and aesthetics of an area. However, before proceeding with the Quechee Lakes analysis with respect to noise, the Court must make a preliminary determination: whether the applicable dBA standard for noise at the Neighbors' houses and areas of frequent human use is 50 dBA or 55 dBA. As explained below, and the applicable standard is 50 dBA.

50 dBA Standard

A fundamental error committed by Tech Environmental was its assumption that the only noise standard which can be applied is 70 dBA at the property line and 55 dBA at areas of frequent human use and residences. In fact, contrary to Mr. Guldberg's testimony, the most recent (and last) decision by the former Environmental Board on quarry noise *reaffirmed* that a town plan or zoning bylaw may impose a more restrictive standard other than the default standard of 70 and 55 dBA.

The former Environmental Board's *Pike* Decision defines when a more restrictive noise standard must be used.

The former Environmental Board reaffirmed in Pike that a more restrictive noise standard must be applied when there is a specific town plan or zoning bylaw provision that imposes an "inconvenience" or "nuisance" test on noise from a proposed development. While the Board ultimately found such a provision lacking in the Williamstown Town Plan, it nevertheless reaffirmed its prior holdings in McLean and Re: Dominic A. Cersosimo and Dominic A. Cersosimo Trustee and Cersosimo Industries, Inc., #2W081 3-3-EB, Findings of Fact, Conclusions

of Law, and Order (Revised) (Apr. 19, 2001) that such a test overrides the default 70 and 55 dBA standards:

The [opponent] parties argue that the Williamstown Town Plan contains language that sets forth a clear, written community standard intended to preserve the quiet of the area. Specifically, the Town Plan states that the extraction of earth resources is only allowed “provided any such project is designed and proposed so as to mitigate any negative impact upon neighboring property owners including ... noise.” They argue that this standard is at least as restrictive as the language that the Board relied upon in *Re: McLean Enterprises* and *Re: Dominic A. Cersosimo and Dominic A. Cersosimo Trustee and Cersosimo Industries, Inc.*, #2W081 3-3-EB, Findings of Fact, Conclusions of Law, and Order (Revised) at 10 - 16 (Apr. 19, 2001), where the Board imposed a lower dBA Lmax limitation based on language in the Cavendish and Vernon town plans respectively.

In *Re: Dominic A. Cersosimo, supra*, the Vernon Town Plan stated that “[t]he extraction of earth resources should not have an adverse environmental impact resulting in inconvenience to or burden on neighboring property owners nor represent a burden on municipal facilities.” In *Re: McLean Enterprises, supra*, the town plan stated that the “extraction of earth resources must not result in a nuisance to neighboring property owners through noise or dust, nor be a burden on public services.”

In both of those cases the Board reasoned that if under the standard set in *Re: Barre Granite Quarries, supra*, for Criteria 8 Aesthetics that noise levels above 55 dBA Lmax at any residence or area of frequent human use are offensive and shocking, then restrictions on noise must be established at a level *lower* than 55 dBA Lmax in order to meet the more stringent requirements mandated by an “inconvenience” or “nuisance” test. As a result, in both cases the Board imposed a more restrictive standard of 50 dBA Lmax.

The above provision in the Williamstown town plan applies to a particular area (quarries) and is intended to preserve the aesthetics of the area, therefore, it is applicable under Criterion 8. However, unlike *Re: McLean Enterprises, Inc.* and *Re: Dominic A. Cersosimo*, it only requires quarry operators to mitigate noise impacts. Thus, the language imposes the same requirements as the mitigation requirement already found in Criterion 8 and discussed

below. Therefore, although the language in the Williamstown town plan is applicable under Criterion 8, it does not require the Board to impose a lower dBA Lmax standard.

Re: Pike Industries, Inc. and Inez M. Lemieux, #5R141 5-EB, Findings of Fact, Conclusions of Law, and Order at 42-43 (June 7, 2005).

As the above passage from the Pike decision confirms, where there is an “inconvenience” or “nuisance” test provision, a more restrictive noise level must be applied to a proposed project other than the 70 and 55 dBA standards. The rationale for the more restrictive standard is that the specific municipal language would be rendered meaningless if it equated to nothing more than the 70 and 55 dBA standards. Because Mr. Guldberg did not know that this is the applicable law, he failed to consider that the Moretown Town Plan and Zoning Regulations do, in fact, impose an “inconvenience” and “nuisance” test. Consequently, Tech Environmental’s failure to comprehend the applicable law renders its noise analysis erroneous.

**The Moretown Town Plan and the Moretown Zoning Regulations
Impose an “inconvenience” and “nuisance” test on the proposed Quarry.**

The Moretown Town Plan states at Chapter 4, Natural & Cultural Resources Tasks & Strategies, (page 35), provision 8, as follows:

- 8) The Development Review Board shall, through the conditional use review process, ensure that the extraction of gravel and other mineral resources does not permanently scar the landscape, adversely impact ground or surface waters, **or unreasonably impact adjacent neighbors.**

The Moretown Zoning Regulations state at Section 4.10, Performance Standards, at Section (B), subsection (1) (page 24), as follows:

The following specific standards apply to all uses, with the exception of agriculture and forestry, in all districts. The burden of proof that the following standards are met shall fall on the applicant and/or all successors and assigns.

- (1) No noise shall be permitted which is excessive at the property line **or is incompatible with the reasonable**

use of the surrounding area. Excessive noise shall be considered a sound pressure level that exceeds 70 decibels at the property line on a regular or reoccurring basis.

Based upon a comparison of the provisions discussed in Pike, the Moretown Town Plan and Zoning Regulations impose an “inconvenience” and “nuisance” test. For comparison purposes, here again are the two provisions discussed in Pike which the Board ruled established an “inconvenience” and “nuisance” test:

- * Cersosimo: “The extraction of earth resources should not have an adverse environmental impact resulting in inconvenience to or burden on neighboring property owners nor represent a burden on municipal facilities.”
- * McLean: The “extraction of earth resources must not result in a nuisance to neighboring property owners through noise or dust, nor be a burden on public services.”

Moretown’s prohibition that a quarry project shall not “**unreasonably impact adjacent neighbors,**” and Moretown’s requirement that all uses (other than agriculture and forestry) shall not result in noise which is “**incompatible with the reasonable use of the surrounding area**” fall squarely within the “inconvenience” and “nuisance” test provisions found in Cersosimo and McLean. Accordingly, the standard that should be applied is whether the Quarry would result in noise levels in excess of 50 dBA at any residence or area of frequent human use.

Rivers’ Proposed Quarry Will Exceed Both the 50 and 55 dBA Maximum Noise Level Standards at Neighboring Homes and Areas of Frequent Use.

The Applicant’s noise model does not include any customer trucks, on the haul road or anywhere else. Customer trucks will make significant noise and should have been included in the Applicant’s noise study. During peak hours and peak days of operations, multiple customer

trucks on the quarry site at once will be a frequent occurrence. Rivers' failure to model or account for the noise that would be generated by customer trucks accessing the site is a serious deficiency in its application, especially because, as we conclude below, the inclusion of customer trucks on the proposed haul road results in noise levels above those permitted under Criterion 8, whether we employ a 50 dBA or a 55 dBA maximum noise level standard.

The modeling conducted by Neighbor's noise expert, Mr. Kaliski,⁹ does address the noise generated by customer trucks accessing the quarry site. With two customer trucks operating near the entrance to the site, and no other equipment in the quarry operating (N.2/T.2 Figure 9), sound levels at Byrne/Farley Residence reach 65 dBA and at McMullin Residence reach 62 dBA. With two trucks passing each other closer to the quarry (i.e, farther up the access road away from Route 100B), the sound level reaches 57 dBA at the Holden residence. The perceived loudness of a noise doubles for every increase of ten decibels, thus the perceived noise from the quarry with customer trucks included would be double a noise at the 55 dBA standard and well more than double the noise at the 50 dBA standard at the Byrne/Farley and McMullin residences.

There is no exception for noise generated by vehicles on the access road in Moretown's Town Plan and Zoning Regulations. Nor is there any such exception under Act 250. Rivers' failure to model access road truck noise means that we must rely upon the Neighbors' and Town's noise model to understand how customer truck noise will impact neighboring properties and uses. The noise analysis conducted by Mr. Kaliski, admitted at trial as Exhibit N.2/T.2, clearly shows that if the noise from customer trucks on the proposed access road is included in the noise model, the proposed quarry will generate sound levels at neighboring residences that exceed the maximum sound levels permissible under Act 250, whether those levels are taken to be 50 or 55 dBA.

⁹ Mr. Kaliski's expert report was admitted at trial as Exhibit N.2/T.2.

In addition to omitting any analysis of the noise generated by customer trucks, Rivers failed to model the noise impacts to the Neighbors from the proposed sight line clearing along Route 100B, haul road improvement, and creation of the quarry staging area. These activities are not exempted from the noise level limits in the Moretown Zoning Regulations. (MZR § 3.5(A) (“The removal of soil, sand, rock, stone or gravel, **except when incidental to the construction of a building on the same premises**, may be permitted in designated zoning districts subject to conditional use review in accordance with Section 5.2 and findings that the proposed activity meets the standards below in addition to any other applicable standards contained in these regulations.”) (Bold added for emphasis). Even without considering the tree-clearing, blasting and rock crushing that is proposed to be employed during the construction phase of quarry, construction phase noise will exceed 70 dBA at Rivers’ property line and both the 50 and 55 dBA maximum noise level standards at Neighbors’ homes and areas of frequent use.

The Neighbors’ noise model for construction activities (Figure 12 in N.2/T.2 at 16) assumes one excavator loader and a drill doing ledge removal and a truck on the proposed access road 175 meters from VT 100B. This construction noise model shows that 70 dBA is exceeded at the McMullin field receiver. At this receiver, 73 dBA is from the drill alone. At the McMullin and Byrne/Farley residences, 65 dBA is from the drill alone. In addition, the Holden and Hendrickson residences have sound levels from construction that exceed 50 dBA. The modeling indicates that a level of 70 dBA is exceeded outside of the Applicant’s property due to construction-related noise. Outside of residences, the noise from construction will exceed 55 dBA at two homes and 50 dBA at two additional homes.

Neighbors’ Question #8 of their Clarified Statement of Questions in Docket No. 68-3-07 Vtec asks: “Does the proposed quarry fail to comply with 10 V.S.A. § 6086(a)(8) because it will

have an undue adverse effect on aesthetics, including the scenic or natural beauty of the area, due to noise, trucks, blasting, crushing, drilling, dust, and an industrial scar on the landscape, a scenic landscape that currently supports residential and recreational uses and several horse farms?" We must conclude that the noise from the proposed quarry, which would exceed both the 50 and 55 dBA standards at nearby homes and areas of frequent use, would be offensive and shocking in the context of the surrounding area and would therefore have an undue adverse effect on aesthetics under Criterion 8.

Neighbors' Question #9 of their Clarified Statement of Questions in Docket No. 68-3-07 Vtec asks: "Does the proposed quarry fail to comply with 10 V.S.A. § 6086(a)(9)(E) because Rivers has failed to prove that the proposed quarry will not have an unduly harmful impact upon the surrounding environment or surrounding uses and development, and/or because Rivers will not leave the site in a condition suited for alternative use or development?" We must conclude that the proposed quarry will have an unduly harmful impact upon surrounding land uses under Criterion 9(E)(i), because the noise generated by the proposed quarry would disrupt existing land uses, including the boarding, training and riding of horses on the McMullin and Sainsbury horse farms, the peaceful enjoyment of adjoining residential properties, and recreational use of the surrounding woods, roads and river.

Neighbors' Question #7 of their Statement of Questions in Docket No. 7-1-05 Vtec asks, in part: "Whether, under MZR Section 3.5(C)(1)-(4), the application and proposed quarry will have an undue adverse effect on (1) neighboring properties and uses; [and] (4) the scenic or natural beauty of the area, other aesthetic values, historic sites or rare or irreplaceable natural resources or areas?" We must conclude that under the local standard, as under Act 250, the

proposed quarry would have an undue adverse effect upon neighboring properties and uses and aesthetics in violation of MZR §§ 3.5(C)(1) and 3.5(C)(4).

Neighbors' Question #13 of their Statement of Questions in Docket No. 7-1-05 Vtec asks, in part: "Whether, under MZR Section 4.10(B)(1)-(5), the application and proposed quarry meets the following standards: [. . .] (1) No noise shall be permitted which is excessive at the property line or is incompatible with the reasonable use of the surrounding area. Excessive noise shall be considered a sound pressure level that exceeds 70 decibels at the property line on a regular or reoccurring basis."

MZR § 4.10(B)(1) is twice phrased in the alternative, that is, noise from the proposed quarry cannot be excessive or incompatible with reasonable uses of the surrounding area. Excessive noise is likewise defined in the alternative as noise that exceeds 70 decibels at the property line on a regular or reoccurring basis.

The long-established residences, horse farms and training facilities, and the recreational use of adjoining woodlands, the Mad River, Old Route 100 and Route 100B are all reasonable uses of the surrounding area. The noise from the proposed quarry would be perceived by nearby users as more than double the existing background noise levels and would not only be louder, but also qualitatively different than the existing soundscape. The noise from the proposed quarry, if permitted, will including noise from construction activities; the drilling, blasting and crushing of rock; trucks gearing down to access the site and accelerating away from it; empty customer tracks grinding up the steep haul road and full trucks coming down (whether using engine compression brakes or traveling in lower gears); rock being dumped into empty metal truck beds, pre-blast warning sirens, and explosive blasts.

We must conclude that the proposed blasts, which will generate noise greater than 70 decibels at the Rivers property line on a recurring basis, will therefore violate the prohibition on excessive noise under MZR § 4.10(B)(1). We further conclude that the loud, industrial noise from the quarry would be incompatible with the long-established residential, equestrian, and recreational uses of the surrounding area.

Neighbors' Question #14 of their Statement of Questions in Docket No. 7-1-05 Vtec asks, in part: "Whether, under MZR Section 5.2(C), the application and proposed quarry will not adversely affect [the conditional use criteria, including the character of the area and the bylaws in effect]?" We must conclude that Rivers' proposed quarry would have a substantial and material adverse effect on the character of the area by introducing loud, frequent and recurring industrial noise into this bucolic neighborhood characterized by single family homes, horse farms, and quiet recreational pursuits. In addition, the proposed quarry would adversely affect the bylaws in effect, including MZR §§ 3.5(C)(1), 3.5(C)(4) and 4.10(B)(1).