MANAGING NOISE FROM PITS AND QUARRIES
By Scott Penton, P.Eng., Project Director and David Chadder, Hon. B.Sc., QEP, Principal

INTRODUCTION
Pits and quarries provide much-needed aggregate materials for the construction industry. Aggregate is either removed from underground sand and gravel beds in pits, or created in quarries from blasted rock. Heavy equipment, rock crushers, drills, and blasting used at these sites can produce large amounts of noise. Controlling potential noise impacts is of primary importance for the aggregate industry.

NOISE IMPACTS ARE REGULATED
Pits and quarries operating in Ontario are regulated under two key pieces of legislation:

- The Aggregate Resource Act, administered by the Ministry of Natural Resources (MNR).
- The Environmental Protection Act, administered by the Ministry of the Environment (MOE).

The MNR controls the granting of licences to aggregate producers. The MOE sets out regulations and guidelines to control potential environmental impacts, including noise. In order to receive a licence, new and expanding pits and quarries must conduct noise impact studies to ensure that their proposed operations will meet the required noise guideline limits. Existing quarries must file annual compliance reports, and are subject to inspections by both the MNR and MOE.

NOISE GUIDELINES
Noise impacts from pit and quarry operations must meet provincial noise limits administered by the MOE. These guideline limits are among the most stringent in the world. Relevant guidelines are listed in the table below:

<table>
<thead>
<tr>
<th>Guideline</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPC-205</td>
<td>Sound level limits in urban Class 1 and semi-rural Class 2 areas</td>
</tr>
<tr>
<td>NPC-232</td>
<td>Sound level limits in Class 3 rural areas</td>
</tr>
<tr>
<td>NPC-119</td>
<td>Sound level limits for noise and vibration produced by blasting</td>
</tr>
<tr>
<td>NPC-115</td>
<td>Sound emission limits for motorized construction equipment (e.g., loaders, bulldozers, etc.)</td>
</tr>
<tr>
<td>NPC-118</td>
<td>Sound emission limits for other motorized vehicles (e.g., trucks)</td>
</tr>
</tbody>
</table>

Some municipalities will require their own studies to be conducted, prior to granting any required land-use re-zoning applications.
NOISE FROM NORMAL OPERATIONS

Noise from pits and quarries are subject to MOE NPC-205 and NPC-232 guideline limits. These guidelines are outlined in the following table:

MOE LIMITS ON OPERATIONAL NOISE

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Guideline Minimum (Leq (1hr), dBA)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 7am-7pm</td>
</tr>
<tr>
<td>Class 1 Urban</td>
<td>50</td>
</tr>
<tr>
<td>Class 2 Semi-Rural</td>
<td>50</td>
</tr>
<tr>
<td>Class 3 Rural</td>
<td>45</td>
</tr>
</tbody>
</table>

*Or the background ambient level, whichever is higher.

The guidelines are expressed in terms of one-hour average sound levels (Leq (1 hr) values). For purposes of comparison, the noise in quiet office spaces due to heating and ventilation equipment usually ranges from 45 to 50 dBA.

If the existing ambient noise level in the area is higher than the minimums shown in the table, then the higher value may be used as the limit. For example, if a pit, operated only during the daytime, was located next to a busy highway, and road traffic noise levels were higher than the 50 dBA, then the higher value would be the guideline limit. However, most pits and quarries are located in semi-rural and rural areas, with little background noise. The strict limits generally apply.

In examining potential noise impacts, worst-case cumulative noise impacts from all equipment on the site are considered. Noise sources at a pit or quarry could include such things as:

- Front-end loaders and bulldozers moving around on-site
- Haul trucks while they are on-site
- Diesel generators
- Crushers and screening plants
- Conveyor systems and stackers
- Pneumatic rock breakers
- Rock drilling
- Ancillary operations (e.g., cement plants, maintenance facilities, etc.).

Computerized noise prediction models - which account for the effects of distance, ground cover, topography, atmospheric effects (such as wind and temperature inversions), and mitigation measures—are used to estimate off-site noise levels at surrounding residences and other noise sensitive land uses.

Additional noise mitigation measures are designed and added if required and could include such things as:

- Creating higher perimeter berms
- Altering operating times
- Relocating on-site equipment, or selecting inherently quieter units
- Adding or upgrading silencers on generator sets
- Adding portable on-site noise barriers, or relocating proposed stockpiles.

Once the quarry is in operation, noise monitoring and inspections can be used to ensure that mitigation measures are in place and operating, and that noise guidelines are being met.

NOISE FROM BLASTING

Vibration and concussion noise impacts from blasting are considered separately from normal operations. NPC-119 blasting guidelines are enforced by the MOE. No structural damage to surrounding residences will occur provided these guidelines are met. Blasts are designed to limit vibration and concussion to ensure that the limits are met, and are often routinely monitored.

MOE BLASTING CONCUSSION NOISE LIMITS*

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Limit (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cautionary (no routine monitoring)</td>
<td>120</td>
</tr>
<tr>
<td>Peak Limit (with monitoring)</td>
<td>128</td>
</tr>
</tbody>
</table>

* From NPC-119

NOISE FROM HAUL ROUTES

The Aggregate Resource Act specifies that noise impacts from off-site haul routes must be considered by pit and quarry operators as part of their haul route selection, along with safety, traffic impacts, and other factors. The goal is to seek the best route weighing all factors appropriately.

CONCLUSIONS

Pit and quarry operations have the potential to create noise and vibration impacts at surrounding areas. Computerized noise modeling and noise and vibration monitoring can be used to establish potential impacts. With the inclusion of properly designed mitigation measures, strict Ontario guidelines can be met.