

## Overview of Automated Systems for Vehicle Noise

A scoping review revealed two types of automated systems that could potentially help with enforcement of vehicle noise: (1) Noise Ticketing, and (2) Noise Monitoring. An overview of findings is included below.

Type of System	How does it work?	Where is it being used?	Technical and Legal Viability	Resources and Readiness
<p><b>Vehicle Noise Ticketing</b></p> <p><b>NOT RECOMMENDED</b></p>	<ul style="list-style-type: none"> <li>• <a href="#">Vehicle noise ticketing systems</a> use technology to detect and issue tickets for violations at the street level.</li> <li>• Devices include a class one microphone combined with an array of smaller microphones, &amp; two dedicated cameras for video recording &amp; license plate recording.</li> <li>• Artificial intelligence &amp; algorithms are used to trigger the system to record the offending vehicle’s audio &amp; visual data.</li> <li>• Data is sent to a secure cloud server by 4G cellular for review &amp; action against noisy vehicles through an issued ticket.</li> </ul>	<p><b>Operating locations:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">London</a>, UK</li> <li>• <a href="#">New York</a>, USA</li> </ul> <p><b>Testing locations / Interested locations:</b></p> <ul style="list-style-type: none"> <li>• Miami, USA</li> <li>• California, USA</li> <li>• <a href="#">Chicago</a>, USA</li> <li>• <a href="#">Knoxville</a>, USA</li> <li>• Iowa, USA</li> <li>• Sydney, Australia</li> <li>• Israel</li> <li>• Dubai</li> <li>• Brunei</li> <li>• Interest in 30 other territories</li> </ul> <p><b>Canadian locations:</b></p> <ul style="list-style-type: none"> <li>• None to date</li> </ul>	<p><b>Technical:</b></p> <p>Technology is new and still being tested:</p> <ul style="list-style-type: none"> <li>• Automated noise ticketing is in its infancy with only one company at a level of interest,</li> <li>• Equipment has not been tested in a climate comparable to Calgary.</li> </ul> <p><b>Legal:</b></p> <p>Success in courts is unclear:</p> <ul style="list-style-type: none"> <li>• Current bylaws do not meet the requirements to enforce an automated system.</li> <li>• Amendments are required to target specific decibel sound level limits at set distances,</li> <li>• Data captured may not be sufficient in a court setting,</li> <li>• No example court cases within Canada &amp; limited examples in other jurisdictions,</li> <li>• Need to better understand privacy implications.</li> </ul>	<p><b>Resources required:</b></p> <ul style="list-style-type: none"> <li>• Initial cost &amp; a monthly subscription,</li> <li>• Dedicated power supply,</li> <li>• Annual calibration,</li> <li>• 4G cellular,</li> <li>• Third party data processing,</li> <li>• Requires strategic placement as devices are 20kg.</li> </ul> <p><b>Readiness:</b></p> <ul style="list-style-type: none"> <li>• Bylaw amendments on acceptable decibel levels need to come first,</li> <li>• Requires further monitoring of technology as well as effectiveness of ticketing &amp; court challenges.</li> </ul>

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<p><b>Noise Monitoring</b></p> <p><i>RECOMMENDED</i></p>	<ul style="list-style-type: none"> <li>• <a href="#">Noise monitoring systems</a> are outdoor wireless sensors developed to work within the internet of things ecosystem. The sensors measure and report ambient noise levels in real time using the LoRaWAN network.</li> <li>• Devices can be set to specific thresholds to measure vehicle noise &amp; send alerts in real time.</li> <li>• Data can be viewed on a dashboard or integrated app for a smartphone.</li> <li>• Devices have been piloted by City of Calgary Information Technology &amp; other business units (e.g., to monitor noise for events).</li> </ul>	<p><b>Operating locations:</b> Devices are used worldwide by municipalities:</p> <ul style="list-style-type: none"> <li>• <a href="#">Geneva</a>, Switzerland</li> <li>• <a href="#">Amsterdam</a>, Netherlands</li> <li>• Over 10 North American municipalities as part of a <a href="#">Smart City</a> solution</li> <li>• Multiple other international locations</li> </ul> <p>Note: Devices are used for a variety of noise monitoring purposes.</p> <p><b>Canadian locations:</b></p> <ul style="list-style-type: none"> <li>• Noise monitoring systems are used in Canada but not for the application of vehicle noise.</li> </ul>	<p><b>Technical:</b> The technology is established &amp; already used at The City:</p> <ul style="list-style-type: none"> <li>• Uses City-owned LoRaWAN network,</li> <li>• Battery operated,</li> <li>• Real-time noise measurement with an integrated dashboard &amp; app,</li> <li>• Devices can be set to specific noise thresholds that send alerts once triggered.</li> </ul> <p>Pilot-testing required for vehicle noise application:</p> <ul style="list-style-type: none"> <li>• Has not been specifically verified for vehicle noise,</li> <li>• Device only records decibel levels.</li> </ul> <p><b>Legal:</b></p> <ul style="list-style-type: none"> <li>• Not intended for use in courts or for violation tickets,</li> <li>• No privacy concerns because devices log decibel levels rather than specific sounds.</li> </ul>	<p><b>Resources required:</b></p> <ul style="list-style-type: none"> <li>• City-owned LoRaWAN network is already established in Calgary.</li> <li>• Other required resources are in place with The City of Calgary Information Technology &amp; Emergency Management &amp; Community Safety business units for a collaborative pilot.</li> </ul> <p><b>Readiness:</b></p> <ul style="list-style-type: none"> <li>• Pilot can be used to collect baseline data to help deploy The City’s Traffic Safety Team &amp; understand vehicle noise in Calgary.</li> <li>• This is a cost-effective first step into automated noise systems &amp; can act as a bridge toward potential adoption of ticketing systems in the future.</li> </ul>