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EXPLORING SOUNDSCAPE METHODS AND INTERVENTIONS IN URBAN AND SUBURBAN SOUNDSCAPES

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ABSTRACT

Many mixed-use urban and suburban communities in the United States struggle to achieve balances among people moving back into cities, commercial activities, and entertainment venues that many find desirable in live, learn, work, and play environments. Dynamic documentation, analysis, design strategies, codes, and enforcement activities are required to achieve this balance in rapidly evolving, sustainable cities and towns. Active engagement of the full range of stakeholders in the acoustical communities in each case was essential in understanding and addressing the issues. Multiple meetings with the soundscape participants in organized, community fora, focus groups and discussions with individuals provided ways for all to understand the points-of-view of others as a building block to achieve consensus. Soundwalks with community members were used to understand the issues in situ. Subsequent soundwalks by the study team at multiple times of day and night allowed immersion of the team in the sounds and life of the cities and towns. Simple, but sophisticated, measurement and modeling of the soundscapes were necessary elements in the methods used. Case studies in the communities are presented of desires, issues, methods, analysis, and proposed solutions to a wide variety of acoustical issues encountered in the urban and suburban contexts.

Keywords: *soundscape, design, noise, urban planning*

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1. INTRODUCTION

Case studies of 3 cities and towns are presented to highlight methods, issues and potential solutions for exploring urban and suburban soundscapes where people have expressed concerns about the qualities of their sonic environment. Each of the case studies highlights a different set of issues and potential solutions that were explored using similar methods. Each of the cities and towns had an urban core with mixed use activities and multiple zoning classifications of properties. All included entertainment sounds as one of the concerns expressed by residents and city officials. While the methods used and situations encountered in each case study were similar, then findings and solutions were different. In general, micro scale acoustical situations involving individual source-path-receiver acoustical relationships, operational concepts identified and the architectural configuration of the urban and suburban spaces led to the different solution recommended.

2. METHOD

The general method used was described in Siebein and Siebein (2023) [1]. Specific adjustments were made in some of the cities and towns in response to local conditions. The goals of the study, methods and evaluation of potential solutions were developed by active engagement of the full range of stakeholders in organized community fora, focus group meetings with groups and conversations with individuals to understand the multiple and often disparate points-of-view of the acoustical communities that both create and experience the soundscape. Long-term and short-term measurements of ambient sounds were made at locations identified by local “experts” including business owners, residents and city officials who are also stakeholders in the studies. Measurements and recordings were also made of sounds during soundwalks taken at multiple times of day and night to help form an acoustical





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calendar. The itineraries of the soundwalks were identified by the stakeholders and the researchers. Soundwalks were taken with individual stakeholder groups to experience the city from their perspective and to hear their interpretation of symptoms, causes, potential solutions and other issues while simultaneously experiencing the environment. The research team also conducted undercover soundwalks where they took measurements using concealed devices so they could listen and record events without those making the sounds being aware of their presence. They also conducted straightforward documentary soundwalks where team members simultaneously recorded visual and audio recordings while taking interpretive notes and measuring sounds as well. In most cases the documentation of existing conditions occurred over multiple days and weeks. Data were analyzed based on the specific issues to be explored in each city. Computer models and point source calculations of acoustical levels were built of selected areas to identify source-path-receiver and cause and effect relationships among the variables under study. Interpretations of the data and evaluation of potential acoustical interventions were proposed and evaluated by the stakeholder groups. There were a wide range of potential interventions considered including physical noise buffering or reduction strategies; administrative controls and operational controls.

3. CASE STUDIES

3.1 Case study 1: Small city with entertainment sounds

Case study 1 is a small coastal city with a population of approximately 36,000 people. There is a small “downtown” area with boutique hotels and B&B’s, restaurants, stores and residences. This core is surrounded by a residential area with single family, detached homes with some interspersed commercial activity. Concerns were expressed by residents that entertainment sounds from the restaurants and bars were creating disturbances, especially late at night. The restaurant owners and city officials thought that the disturbances were manufactured by overly sensitive residents because there were only a few people who expressed concerns about each establishment. Soundwalks were taken over 3 weekends on Friday and Saturday evenings and nights when most of the disturbances typically occurred. “Pools” of sound were identified qualitatively by listening during the soundwalks and by the long- and short-term acoustical measurements emanating from each of the entertainment establishments to the one, two or three residences that were immediately adjacent to them. Computer models of sound propagation from each establishment confirmed the field measurements and

observations that the sounds from the establishments propagated to a small number of homes that served as noise barriers to the next groups of homes. This finding confirmed the residents’ complaints were based on relatively loud and potentially disturbing musical and vocal sounds at their homes and not on their over sensitivity to sound. Different approaches to reducing and buffering for each of these sonic niches were taken in addition to larger, scale, city wide policy recommendations. Proposed interventions included localized noise buffering and reduction strategies for the entertainment establishments, restaurants and residences. The measured sound levels were categorized in 3 general groups: quiet ambient sounds which were the lowest sound levels consisting of breezes blowing through the vegetation, insects, and pauses in road traffic; urban ambient sounds that included the quiet ambient sounds and sounds of vehicles driving on streets, air-conditioning systems operating and other typical sounds in the city; “light” musical sounds; and musical sounds that were perceived as disturbances. The quantitative differences in overall A-weighted and C-weighted sound levels and octave band sound spectra taken during the soundwalks for each were used to help determine possible sound level limits for different zoning categories in the city. Mitigation systems were proposed for each specific location based on local conditions and operating parameters for each sonic niche based on the qualitative observations of the “local experts” and researchers. quantitative measurements and analysis of each individual source-path-receiver situation to deal with the localized conditions.

3.2 Case Study 2: Medium size city with active urban core

Case study 2 took place in the center of a medium size city with a population of 90,000 people that was having a resurgence of residential construction in its core district as people were moving back into the city from peripheral suburbs. This resulted in a mixed-use area with several streets of entertainment establishments and restaurants with indoor and outdoor entertainment in close proximity to newly constructed multi-family residential buildings. There were also office and other commercial occupancies interspersed among the restaurants in this area as well. Soundwalks at multiple times of day and night identified a complex interweaving of acoustical communities, itineraries and sounds contributing to the soundscape of the city. This included people driving up and back on the 2 main streets making a loop to find their friends and identify where they wanted to go often with their windows down and car stereos playing somewhat loudly; groups of people





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and individual walking up and down the streets actively talking with each other in slightly raised voices; people talking and music playing at multiple establishments along the street. Long term continuous sound level measurements were made at several selected locations in the area. Short term “spot” measurements were also made to identify specific acoustic events where they could be isolated from the aural context to the greatest extent possible. Extensive data analysis of site and activity specific measurements were necessary to isolate to a degree the levels, durations and frequency content of the sounds made at any of the establishments from the sounds of the vehicles and people on the street. Interestingly, it was difficult to take acoustical measurements for noise ordinance enforcement purposes that could be definitively attributed to any one sound source due to the number and complexity of sound sources on the main streets. Therefore, changes to the zoning noise ordinance and enforcement policies were made to allow these items to be clearly addressed.

3.3 Case Study 3 Entertainment district in a large city

Case study 3 took place in the entertainment district of a city with a population of 404,000 people. A special entertainment district with a unique sonic environment was developed in an underutilized section of the city where old warehouses and factories once existed. The areas were located several blocks away from the downtown area and was no longer a vital part of the city. Night clubs, bars, restaurants with outdoor entertainment and other venues that operated into the early morning hours gradually moved into the area. There were many outdoor amplified entertainment establishments along one main street as well as a number of interior establishments built into old brick bearing wall and metal or timber framed factory or warehouse buildings located in the area. Many of the establishments had large loudspeakers placed in open windows or hanging off canopies or other building elements outside the building playing the music listened to outside on the street as a form of advertisement to encourage people to come inside. The result was a street with a cacophony of different genres of music played very loudly that one moved in and out of as you walked down the street. Many of the establishments had traditional party walls of multiwythe brick masonry meaning that the structure of the buildings was tied together which formed a ready path for sounds and vibrations to travel through the building structure in addition to the airborne sound paths between buildings. Once the vitality of the area was reinvigorated, people began to move back into the area in close proximity to the entertainment establishments. Residents moving back

into the area restored some of the warehouses on the main street to make apartments and condominiums. They also started to restore the single story, wood frame dogtrot houses on the blocks off the main street. Once people moved back in to the area, the loud street music created some disturbances and resulted in enough complaints from residents that a sound study was commissioned. Similar methods were employed for this study as the first two with the addition of adding noise dosimetry measurements for police officers working in the area. The soundwalks were done as “undercover” soundwalks so that the operators of the establishments and people who were on the streets did not know that measurements were being taken. This was done so that people would not adjust the sound levels of the music in the different entertainment venues and people visiting the establishments would not adjust their behaviors. The primary findings of the study were that many establishments violated the sound level limits in the noise ordinance. Effective enforcement of the noise ordinance was not possible. Alternates were proposed for sound level limits, enforcement policies, infrastructure improvements to the entertainment, commercial and residential establishments; operational policies such as limits on outdoor loudspeakers for advertising purposes; and recommendations for future development in the area. Also, all police officers equipped with dosimeters on all days exceeded their allowable noise dose without hearing protection. Therefore, adjustments to the sound level limits and personal hearing protection devices were recommended to address this issue.

4. CONCLUSIONS

4.1 Summary

Several interesting soundscape intervention strategies were identified in the case studies that became building blocks for future studies in other urban and suburban areas as well as within the soundscapes of individual building projects. These included identifying sonic niches as local conditions, city wide data analysis strategies, the need for multiple types of soundwalks to deal with the unique character of each condition studied, practical difficulties extracting the contributions of individual sounds and their levels in complex urban soundscapes and unique and perhaps unforeseen potential effects of amplified entertainment sounds in the city.





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4.2 Sonic niches

Sonic niches were identified in the cities and towns by qualitative observations of the residents and confirmed by the soundwalks and acoustical measurements. Acoustical studies of the localized conditions led to potential site-specific strategies for reducing, buffering and mitigating the sounds affecting specific groups of residents. The idea of groups of individual sonic niches affected by unique source-path-receiver conditions making up the fabric of a city or town helps identify the importance of local conditions and the possibility of micro scale investigations even in larger urban contexts as being able to contribute to the understanding and design process and quality of urban living.

4.3 City wide data analysis

Macro scale analysis of city-wide measurements made through soundwalks, long term measurements at fixed locations and measurements of specific acoustic events at individual locations provided ways to use the quantitative data to provide insights into potential applications in ordinances and other municipal regulations.

4.4 Different types of soundwalks

Different types of soundwalks were needed in each city and town due to the specific conditions under investigation and the different urban fabric in each. For example, in the large entertainment district, venue operators turned down the levels of the street loudspeakers when they saw the researchers approaching with officers and taking notes during the sound walk. Future soundwalks were made incognito with concealed equipment and the researcher dressed as people coming to the establishments. Soundwalks with individual and small groups of stakeholders in each environment were very useful in listening to the sounds and comments of the local experts as an initial orientation to the local conditions. These were often taken at the times of day when observation of the specific conditions could be observed.

4.5 Unforeseen effects of amplified sounds

The effects of amplified sounds played in outdoor entertainment venues or through loudspeakers placed in windows or canopies outside building to “advertise” what is going on inside their establishment produced conditions that resulted in extremely short distances for just possible speech recognition for law enforcement officers and in enforcement officers exceeding the allowable 8 hour time-

weighted average noise exposure while working in the area without personal hearing protection devices. The officers, as one of the local experts, had qualitatively experienced symptoms associated with noise exposure and had expressed concerns that were confirmed by the study.

5. REFERENCES.

- [1] G.W. Siebein and K.M. Siebein. Architectural Soundscapes: Theories, Methods and Practice. In B. Schulte-Fortkamp and A. Fiebig, eds.: *Soundscapes: Humans and their Acoustic Environment*. Springer, 2023.

