

CHELSEA CREEK COMMUNITY BASED COMPARATIVE RISK ASSESSMENT

CHAPTER 6: NOISE

1. Overview of Noise in the Chelsea Creek Community

Chelsea and East Boston are densely populated communities that are located along the major thoroughfares in and out of the City of Boston. Chelsea and East Boston are home and adjacent to many industries that use trucks to transport their goods, and Logan Airport, a major source of noise and traffic, is located in East Boston and in close proximity to Chelsea. The large volume of traffic that passes through these communities as a result of their location and commercial base make Chelsea and East Boston prone to high levels of noise pollution. Many of the comments collected during the Community Based Comparative Risk Assessment related to the noise generated by airplanes. While information on the airport will be included in this chapter, this document is primarily focused on sources of noise and environmental impacts other than aircraft operations.

Noise is a concern to residents of Chelsea and East Boston because of its frequency, intensity, daily annoyance, and possible health effects. Constant exposure to noise from traffic, construction, airplanes, social noise, such as music or parties, and other sources has been associated with many health concerns including hearing loss, sleep disruption, increased physical and psychological stress, high blood pressure, and the development of heart disease.¹ There is evidence that exposure to noise can affect children's language development and the ability to learn.²

Noise is quantified in units of "decibels" which measure the intensity of the noise. An increase of 10 decibels (dBs) is heard as a doubling of loudness. Decibels are also sometimes written as "dBa." This indicates that the decibel level has been adjusted to account for the hearing range at which humans are most sensitive.

Examples of decibel levels of some common sounds and how they are perceived are listed in Table 18.

In addition to being associated with a number of public health concerns, noise has also been shown to have a negative impact on property values. The 1982 Federal Highway Cost Allocation Study estimated that "housing units lose 0.4 percent of their value for every decibel above the threshold level, 55dBA (A weighted decibel scale)."³

¹*Noise: A Health Problem.* United States Environmental Protection Agency, Office of Noise and Abatement Control. August 1978.

²*Cornell Researcher and His Co-Authors Find Everyday Traffic Noise Harms the Health and Well-Being of Children.*
<http://www.cornell.edu/releases/May01/roads.noise.kids.ssl.html>

³*Road Engineering Journal.* US Roads October 1, 1997 <http://www.usroads.com/journals.p/rej/9710/re971004.htm>

Table 18 - Decibel Levels of Some Common Sounds		
Common Sounds	Noise Levels (dB)	Effect
Air raid siren	140	Painfully loud
Jet takeoff	130	Painfully loud
Discotheque	120	Maximum vocal effort
Pile driver	110	Maximum vocal effort
Garbage truck	100	Maximum vocal effort
City traffic	90	Very annoying, hearing damage
Alarm clock	80	Annoying
Freeway traffic	70	Phone use difficult
Air conditioning	60	Intrusive
Light auto traffic	50	Quiet
Living room	40	Quiet
Library	30	Very quiet
	36900	Just audible

Nadakavukaren, Anne. *Our Global Environment*. 2000

Noise produced by traffic is a combination of noises produced by engines, exhausts, and tires on the road from the various vehicles using roadways.⁴ Noise generated by traffic is dependent upon three factors: the volume of traffic, the speed of traffic, and the number of trucks in the flow of traffic.⁵ The Federal Highway Administration (FHWA) states, “the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and a greater number of trucks.”⁶ The FHWA also notes that road conditions such as steep inclines or uneven pavement will increase the noise from traffic.⁷

⁴Corridor H: West Virginia Division of Highways <http://www.wv.corridorh.com/engineer/noise.html>

⁵US Department of Transportation, Federal Highway Administration. *Highway Traffic Noise*. 09/1980

⁶Ibid

⁷Ibid

Noise levels along federal highways are governed by the Federal-Aid Highway Act of 1970. This Act authorized the FHWA to develop noise level standards and regulations for highway traffic noise on new federally funded highway projects. FHWA regulations regarding the mitigation of highway traffic noise are contained in Title 23 of the United States Code of Federal Regulations Part 772 (23 CFR 772), entitled “Procedures of Abatement of Highway Traffic Noise and Construction Noise.”⁸

Noise impacts on a community must be considered each time a highway is constructed or modified. However, for roadways that are already in place, there is no noise monitoring or mitigation required by law. Massachusetts Highway Department does conduct some noise mitigation. Interstate highways within their jurisdiction have been evaluated and prioritized for noise control efforts. Unfortunately, Route 1 and the Tobin Bridge do not fall within this program as they are not interstate highways.

Massport’s Noise Abatement office enforces and monitors air carrier compliance with Logan’s noise rules. This report does not focus on aircraft as a source of noise; for information on how to contact the Massport program, see Section 9 of this chapter.

Noise within Chelsea and East Boston, other than noise generated by federal highways and Logan Airport, is governed by state and local noise ordinances. Massachusetts noise laws are part of the Air Pollution Control Regulations and establish an increase of 10 decibels above ambient noise levels as the maximum acceptable noise level. Ambient noise levels vary depending on the neighborhood, so based on this law, more noise is tolerated in urban neighborhoods than in suburban areas.

Local ordinances include the regulation of construction hours, noise levels at residential property lines, and unreasonable noise from automobile safety devices.⁹ The Noise Ordinance for the City Boston states: “Unreasonable or excessive noise shall be defined as noise measured in excess of 50dBA between the hours of 11:00pm and 7:00am or in excess of 70 dBA at all other hours when measured not closer than the lot line of a residential lot or from the nearest affected dwelling unit.”¹⁰ This applies to social noise such as parties. The Boston Air Pollution Control Commission also regulates noise from stationary sources such as air conditioners, HVAC and mechanical ventilation equipment, refrigeration equipment, construction sites and other sources. The general standard for noise affecting a residential property is 60dBA daytime (7AM-6PM) and 50 dBA all other times. The Noise Ordinance can be enforced by the police department, the Boston Air Pollution Control Commission, or the Boston Public Health Commission.

⁸Corridor H: West Virginia Division of Highways
<http://www.wvcorridorh.com/engineer/lnkframe/analysisguidance.html>

⁹NPC Law Library: Boston, Massachusetts Noise Ordinance <http://www.nonoise.org/lawlib/cities/boston.htm>

¹⁰Boston, Massachusetts Noise Ordinance 16-26.6, <http://www.nonoise.org/lawlib/cities/boston.htm>

The Chelsea noise ordinance defines unreasonable noise as noise “plainly audible at a distance of three hundred feet.” The distance is reduced to 200 feet during night time hours (10 pm - 8 am) and to 150 feet in residentially zoned areas of the city. There are also specific restrictions on construction and use of outdoor tools in the ordinance. The Chelsea police are responsible for investigating complaints regarding unreasonable noise and can issue warnings and citations if necessary.

2. Review of Existing Noise Pollution Information

The majority of data on noise pollution for Chelsea and East Boston is from Logan Airport. This data has been compiled by a number of organizations that seek to stop the expansion of the airport. The data gathered by these groups refutes claims by the FAA and by Massport that airport noise will decrease with the expansion. Data from these groups indicated the opposite; noise from the airport will increase in Chelsea, East Boston, and other communities located near Logan.

Massport maintains a database of noise complaints about the airport. Information for this database is gathered from calls to Massport’s 24 hour complaint hotline. A tabulation of the data from 2001 shows that East Boston residents contacted Massport 287 times during the year, and Chelsea residents logged 90 complaints. Contact information for Massport and other groups regarding noise from Logan Airport is included at the end of this chapter.

Massport also oversees the maintenance of the Tobin Bridge, a source of traffic noise in East Boston. According to the Massport community affairs office, the agency has conducted several studies of noise impacts from the bridge, usually in response to requests by local officials or residents. The studies have not shown impacts over the Federal threshold of noise limits (10 dB over ambient conditions), meaning that no mitigation has been required, although on-going maintenance projects such as road resurfacing are conducted to help minimize traffic noise.

Both the Chelsea and East Boston Police Departments maintain information on noise complaints within these communities. The information is not organized in a format that is easily accessible, so no data from police departments is included in this report. A study to go through noise complaint files and categorize them would be necessary in order to determine the type, frequency, and location of noise complaints. The East Boston police department indicated that the majority of noise complaint calls are related to loud parties and dogs.

3. Analysis of Existing Noise Pollution Information

Very little data on noise is available, and the data that has been collected most likely under represent the actual extent of noise impacts on the community. Noise complaint data, collected both by Massport and the East Boston and Chelsea police departments, provide an indication that there are noise impacts. However, complaints only capture a fraction of the actual number of incidents. It is likely that many residents do not call in complaints, in part

because City ordinances regarding noise and numbers to call with complaints are not well known. The decision to file a complaint also may be made based on the perception of what a complaint will accomplish. Without a clear indication of how a complaint would be addressed and the situation improved, it is likely that many residents would not register complaints.

The threshold for action by Massport for aircraft noise is set by the FAA at 65 dB. In the case of Massport roadways, corrective actions are only recommended if noise generated exceeds ambient levels by 10 dB. In both cases, many residents are subject to noise levels that they find objectionable, but mitigation measures are not available to them. The thresholds that have been established should be examined to determine if they are adequately protective of residents or if new limits, which take frequency of noise levels as well as intensity into account, should be set.

4. Potential Concerns for Public Health and the Environment

Noise is an annoyance and a public health concern. As listed in Table 19, constant exposure to noise from traffic, appliances, airplanes and other sources has been associated with a number of health concerns:

5. GIS Maps of Available Noise Data and Information

Note: There is a map associated with this chapter - download the map entitled: Potential Noise Sources Along Chelsea Creek

There is a potential for health impacts of noise when noise generation is located close to sensitive receptors such as homes and schools. The attached map shows the locations of commercial and industrial enterprises along Chelsea Creek along with highly trafficked roads and the airport. These potential sources of excessive noise are located adjacent to and through the highly residential areas of East Boston and Chelsea that are highlighted on the map.

6. Current Noise Pollution Projects or Activities in Chelsea and East Boston

In 1994 Massport began a pilot residential soundproofing program to deal with noise directly generated by Logan Airport. The Residential Sound Insulation Program may include installing new windows, doors, acoustical tile ceilings, and applying acoustical caulking and weather stripping. Additionally, residents involved in the program may choose room to have double walls and ceiling treatments installed to achieve maximum acoustical benefits. Residences eligible for inclusion in the Residential Sound Insulation Program must be within the LDN 65 Contour,¹¹ and the decibel level at the residence must be at 65 for an

¹¹ The Day-night Average Sound Level (Ldn) is the level of noise expressed (in decibels) as a 24-hour average.

extended period of time. The FAA determines the 65 dB contour based on flight information from the airport; if funding for retrofitting is available, residents within the eligible area may participate in the program. At this time, 7000 residential units in over 3,500 homes in East Boston, Revere, South Boston, and Winthrop have been soundproofed, but homes in Chelsea do not fall within the 65 dB line.

Table 19 Public Health Concerns Related to Noise	
Hearing Loss	Hearing loss can be of varying degrees. It can mean difficulty hearing sounds such as a telephone ring, a clock ticking, or the inability to distinguish between certain consonants (ie) <i>s, sh, ch, m, p, t, f and th</i> . ¹² The World Health Organization notes that hearing loss of this magnitude may also cause problems with concentration, fatigue, uncertainty and lack of self-confidence, irritation, misunderstandings, decreased working capacity, problems in human relations, and stress reactions. ¹³ Hearing loss can also result in a sharp, painful ringing in the ears (This may also impede sleep).
Sleep Loss	Regular and uninterrupted sleep is needed for good health. Primary sleep disturbance effects are: difficulty falling asleep, awakenings, and alterations of sleep stages or depth. Sleep loss as a result of noise can also induce increased blood pressure, increased heart rate, increased finger pulse amplitude, constriction of blood vessels, changes in respiration, irregular heart beat, and an increase in body movements. ¹⁴ Secondary effects of sleep loss include: increased fatigue, depressed mood or well-being and decreased performance. ¹⁵
Effects on Children	<p>Cornell University completed a study in 2001 on the effects of traffic noise on the health and well-being of children. The report concludes that the low-level noise of everyday local traffic can cause stress in children and raise blood pressure, heart rates and levels of stress hormones. The study also found that girls exposed to traffic noise became less motivated.¹⁶</p> <p>When children are exposed to a high level of noise at school and at home, language development and the ability to read may be affected. In the early 1970s a study comparing reading ability among children living on different floors of an apartment building located adjacent to a busy highway was conducted. The study found that children living on the lower, noisier floors had lower reading levels than those children living on the higher, quieter floors. Researchers found that a noisy home environment has more of an impact on reading skills than do such factors as parent's educational level, number of children in the family, or the child's grade level.¹⁷</p>

¹²Nadakavukaren, Anne. Our Global Environment: A Public Health Perspective. (2000: Waveland Press, Illinois) page 516

¹³The World Health Organization <http://www.who.org>

¹⁴The World Health Organization <http://www.who.org>

¹⁵Ibid

¹⁶Cornell University, *Cornell Researcher and his Co-Authors Find Everyday Traffic Noise Harms the Health and Well-being of Children* <http://www.news.cornell.edu/releases/May01/roads.noise.kids.ssl.html>

¹⁷Ibid, 521

Table 19 Continued	
Mental Health Effects	While environmental noise is not believed to be a direct cause of mental illness, it is assumed that it accelerates and intensifies the development of mental disorder. Studies on the adverse effects of environmental noise on mental health include the symptoms of anxiety, emotional stress, nervous complaints, nausea, headaches, instability, argumentativeness, sexual impotency, changes in mood, increased social conflicts, as well as general psychiatric disorder such as neurosis, psychosis and hysteria. Large-scale population studies have suggested that there is an association between noise exposure and a variety of mental health indicators such as perception of well-being, standard psychological symptom profiles, the intake of psychotropic drugs, and the consumption of tranquilizers and sleeping pills.
Stress and High Blood Pressure	Unwanted noise induces stress. Stress can lead to an increase in heart rate, high blood pressure, elevated levels of blood cholesterol, ulcers and colitis. ¹⁸

The 65 dB threshold means that many homes which are subject to aircraft noise are not eligible to receive any mitigation assistance. This is a source of frustration for many residents. A program which offered partial assistance based on the decibel level at different locations or that took frequency of noise impacts into consideration would offer residents just outside of the 65 dB line some relief.

Although the Central Artery/Tunnel (CA/T) Project does not directly impact Chelsea and East Boston, the CA/T noise control program is an example of mitigation efforts which are being undertaken in a Massachusetts community and could potentially be used in Chelsea and East Boston. Noise Control Specification 721.560 “sets noise limits for the contractor, describes required submittals, contains contract-specific noise mitigation commitments, and provides guidance on source, pathway and receptor noise control options.”¹⁹ The noise control program includes the evaluation of potential traffic and construction noise impacts and performing short-term and long-term noise compliance.²⁰ The project also includes an Off-Site Mitigation Policy. Residents who are eligible for the program receive bedroom window treatments to reduce construction noise inside their homes.

Finally, acoustical window treatments can provide a quieter indoor noise environment. The

¹⁸Nadakavukaren, Anne. Our Global Environment: A Public Health Perspective. (2000: Waveland Press, Illinois) page 519

¹⁹Erich Thalheimer, “Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project,” *Noise Control Engineering Journal* 48 (5), 2000 September-October 2000

²⁰Ibid

following is a list of acoustical window treatments that can reduce noise levels:

- Interior glass sash - simple to install, least costly, good noise reduction, no historic restrictions, limits sill space. Estimated cost \$800 per sash.
- Interior clear vinyl curtains - simple and quick, inexpensive, somewhat unattractive. Estimated cost \$250 per curtain.
- Full replacement and acoustical windows - double or triple pane glass, excellent noise reduction, expensive. Estimated cost \$1200 - 2500 depending on the size.
- Exterior storm sash - inexpensive, marginal additional noise reduction, subject to historic preservation limits²¹. Estimated cost \$500 per sash.

It should be noted that the cost estimates are based on the Central Artery program; the estimates include the cost of installation which may be lower for private residents.

7. Greatest Noise Pollution Concerns for Residents

Because of the “visibility” of noise pollution from traffic and Logan airport, noise pollution from these two sources are of the greatest concern for residents of Chelsea and East Boston. However, given the urban nature of Chelsea and East Boston, noise pollution from other sources is also of concern and should be recognized. These sources may include appliances and music; underlying causes of noise complaints may include close-proximity between dwellings and noise sources due to urban density and inadequate soundproofing. While some of the sources of noise pollution may be a matter of personal choice, others may not be. There is little data on these sources of background noise, and little data on the health effects of this type of noise. However, it is generally accepted that there are health effects from background noise, and that background noise can lead to reduced property values.

8. Recommendations to Address the Greatest Noise Pollution Problems

Community Actions

- Encourage local and state officials to make noise monitoring and abatement an ongoing, annually funded program.
- Work with Massport to increase the number of homes covered in noise mitigation programs.
- Work with local officials to control traffic in order to reduce noise . This might include reduced speed limits, expanded truck exclusions, and restrictions on commercial traffic to specific hours. through the use of truck exclusions.
- Conduct a study to determine the type of noise complaints in Chelsea and East Boston and the decibel levels that are associated with different types of noise.
- Educate community about the noise ordinance - what the limits are, what residents can

²¹Erich Thalheimer, “Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project,” *Noise Control Engineering Journal* 48 (5), 2000 September-October 2000

do, and who has the authority to control noise.

Longer-Term Priorities

- Work with City government and agencies to evaluate buffer zones, noise barriers and vegetation as options to reduce noise levels. **Buffer zones** are open and undeveloped land that border a highway that are usually bought by highway agencies so that future dwellings and development cannot be built close to the highway. **Noise barriers** are solid obstructions, either earth berms or free standing walls, constructed between a highway and noise-sensitive receptors adjacent to the highway. Barriers must be long enough and tall enough to block the view of the highway, and must not have many breaks or openings. **Vegetation** must be high, wide and dense enough so that it completely blocks the roadway. The FHWA does not consider the planting of vegetation to be a noise abatement measure because it is almost impossible to plant enough vegetation along a roadway to achieve a meaningful level of noise reduction.
- Undertake a study to determine what sources of noise pollution are causing the greatest harm and concern. The City of Denver, Colorado conducted a noise survey in 1995 which identified the sources of noise and the levels of noise which impacted residents. The information was used to evaluate the adequacy of local noise ordinances.

Personal Actions

- Report noise disturbances to the proper authorities so that an accurate record of noise impacts can be developed.

9. Contact List

MassPort

Noise Abatement Inquiries	617-567-3333
Noise Complaint Hotline (Airport)	617-561-3333
Air Traffic Inquires	617-567-6622
Information on the Residential Sound Insulation Program	617-561-1636
Communities Against Runway Expansion (CARE)	617-442-1638 www.stop1432.com
US Citizens Aviation Watch	www.us-caw.org
Noise Pollution Clearinghouse	www.nonoise.org
Chelsea Police Department	617-660-1555
Boston Police Department, District 7 (East Boston)	617-343-4220

References:

Denver Department of Environmental Health. Denver Noise Survey 1995 and Analysis of the Denver Noise Control Ordinance. January 1997.

Feitelson, Eran I., Robert E. Hurd, Richard R. Mudge. The impact of airport noise on willingness to pay for residences. *Transportation Research*. 1(1).1996.

Lercher, Peter. Environmental noise and health: An integrated research perspective. *Environment International*. 22(1): 1996.

Rosenlund, M., N Berglund, G Pershagen, L Jarup, G Bluhm. Increased prevalence of hypertension in a population exposed to aircraft noise. *Occupational Environmental Medicine*. 58:769-773. (2001).

Thalheimer, Erich. Construction noise control program and mitigation strategy at the Central Artery/Tunnel Project. *Noise Control Eng. J.* 48(5): Sept-Oct 2000.

Van Kempen, Elise E.M., Hanneke Kruize, Hendriek C. Boshuizen, Caroline B. Ameling, Brigit A.M. Staatsen, and Augustinus E.M. de Hollander. The association between noise exposure and blood pressure and ischemic heart disease: A meta-analysis. *Environmental Health Perspectives*. Vol. 110(3). March 2002.