

City of Newburyport Zoning Board of Appeals
Application for an APPEAL

Petitioner: Frances Gibbons c/o Lisa Mead, Mead, Talerman & Costa, LLC

Mailing Address: 30 Green Street, Newburyport, MA 01950

Phone: (978) 463-7700 Email: lisa@mtclawyers.com

Property Address: 1 Inn Street, Unit 7, Newburyport, MA 01950

Map and Lot(s): Map 4, Lot 31-G Zoning District: B2

Book and Page(s): Book 34399, Page 69

Owner(s) Name: Frances Gibbons

Mailing Address (if different): _____

The petition for the Appeal is made under the Newburyport Zoning Ordinance section X.H-5 and M.G.L.s c.40A, s.8 & 15.

Brief description of Appeal:

The Petitioner is appealing a denial of a request for issuance of a cease and desist letter by the Zoning Enforcement Administrator dated April 6, 2018 for noise and vibration in excess of what is allowed under Newburyport Zoning Ordinance Sections XI-F and XI-G due to the operations associated with the property located at 35 Market Square, Map 4, Lot 31-A.

Any advice, opinion, or information given by any board member or any other official or employee of the City of Newburyport shall not be binding on the Zoning Board of Appeals. It shall be the responsibility of the petitioner to furnish all supporting documentation with this application. The dated copy of this application received by the City Clerk or Planning Office does not absolve the petitioner from this responsibility. Failure to comply with the application requirements, as cited herein and in the Zoning Board Rules and Regulations may result in a dismissal by the ZBA of this application as incomplete.

Petitioner's and Owner's signature(s):

Frances Gibbons 5-2-18



Mead, Talerman & Costa, LLC
Attorneys at Law

30 Green Street
Newburyport, MA 01950
Phone 978.463.7700
Fax 978.463.7747

www.mtclawyers.com

May 4, 2018

By Hand

Ed Ramsdell, Chair
Zoning Board of Appeals
City of Newburyport
City Hall
60 Pleasant Street
Newburyport, Massachusetts 01950

Re: 1 Inn Street, Unit 7, Newburyport (the "Property"); Appeal of Zoning Administrator's Denial of Zoning Enforcement Request.

Dear Chair and Members of the Board;

Reference is made to the above-captioned matter. In that connection, this firm represents Frances Gibbons (the "Petitioner") who is the owner of the Property. The Petitioner originally sought enforcement in a January 11, 2018 letter to the Zoning Enforcement Officer asserting that an apparatus installed on the roof of Petitioner's residence by 35 West Row Café and Bar (the "Café"), located downstairs from Petitioner at 35 Market Street emitted noise and vibration which violated the Newburyport Zoning Ordinance. See letter attached as **Exhibit A** and photograph of apparatus attached as **Exhibit B**. In a February 20, 2018 letter, counsel for the Café outlined remediation work which would be undertaken by no later than March 16, 2018 to remedy the offensive noise and vibration. See **Exhibit C**. On March 26, 2018 Petitioner again submitted a Zoning Enforcement Request and a Cease and Desist Request to the Zoning Code Enforcement Officer stating that the noise and vibration continued at levels which violated the Zoning Ordinance after the installation of these remedial measures. See **Exhibit D**.

On April 6, 2018 the Zoning Enforcement Officer submitted a letter stating that during visits to the premises on March 29, 2018 and March 30, 2018 no vibration was physically felt or observed. See **Exhibit E**. The Zoning Enforcement Officer further stated that on April 4, 2018 testing was carried out by representatives of the Newburyport Health Department and that the noise levels were within what is allowable. The letter stated "although still audible the most recent readings fall within the acceptable range." The noise readings are attached as **Exhibit F**.

This Appeal is made pursuant to the City of Newburyport Zoning Ordinance ("Ordinance") section X-H(5) and G.L. c. 40A, § 8 of the Zoning Enforcement Officers April 6, 2018 determination.

The Ordinance addresses vibration in Section XI-F and Noise in Section XI-G. See **Exhibit G**. Section XI-F of the Ordinance states: "No vibration which is discernible to the human sense of feeling for three minutes or more in any hour between 7:00 a.m. and 7:00 p.m., or for thirty (30) seconds or more in any one (1)

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hour between 7:00 p.m. and 7:00 a.m. shall be permitted.” The Petitioner continues to feel what she describes as vibration despite the work that has been undertaken by the Café. In addition, we engaged a noise and vibration expert, David Coate, of David Coate Consulting who took noise and vibration readings in the Property between 1:15 and 2:15 p.m. on April 25, 2018. Mr. Coate’s report is attached as **Exhibit H**.¹ As you can see from the report there is an industry standard for human perception of vibration, the ISO 2631 Perception Level, and equipment is available to quantitatively determine whether or not vibration exceeds this threshold.

Section XI-G of the Ordinance states that the “[m]aximum permissible sound pressure levels at specified points of measurement for noise radiated continuously from a facility between 10:00 p.m. and 7:00 a.m. shall be as follows:” and then lays those levels out in a table which gives a maximum decibel level per frequency band. See **Exhibits G, H**. Petitioner states that noise and vibration continue constantly from approximately 9:00 a.m. until at least 11:00 p.m., and appear to grow louder in the evening. It is also the understanding of the Petitioner that the ventilation fan speed can be increased and decreased manually within the Café, which may account for noise differences during busier evening hours, this increase in noise also could be caused by a drop in ambient noise in the evening hours.

Mr. Coate’s testing led him to several conclusions regarding the testing carried out by City staff. In order to determine whether or not Section XI-G of the Ordinance is being complied with, frequency-based measurements must be taken rather than the overall single value dBA measurements taken by City staff. City staff measured the levels according to the criteria established by the Massachusetts Department of Environmental Protection (“DEP”) to determine compliance with 310 CMR 7.10 which prevents noise-based air pollution. See **Exhibit I**. These dBA measurements are for measuring outdoor sound. There are three overarching flaws with the dBA measurements taken by City Staff to determine compliance with the Ordinance. First, these dBA measurements do not capture the sound pressure levels at the various frequencies laid out in the Ordinance. Second, these dBA measurements should not be used to measure indoor noise; an increase of noise approaching 10 dBA over ambient in an indoor setting would be unbearable to the average person for any appreciable length of time. Lastly, City staff did not determine whether or not the noise was a “pure tone.” A “pure tone” noise cannot exceed 3 decibels at a particular frequency compared to its adjacent frequency bands even in an outdoor setting. Under DEP standards the measurements are to be taken “at the property line” and “at the nearest inhabited residence.” In sum, the City Staff testing was not done in a manner to determine if the Ordinance was violated and therefore is flawed. Further, the City Staff applied outdoor noise criteria and testing inappropriately for an indoor noise problem.

Mr. Coate’s testing followed the criteria established in the Ordinance. See **Exhibit H**. The Ordinance sets out frequency bands and has a maximum allowable sound pressure levels within those bands, rather than a comparison to ambient levels. The measurements taken by Mr. Coate found that the Air Handling Unit noise peaks at 31.5 Hz and that this noise is a “pure tone.” These measurements establish unequivocally that the noise in the 31.5 Hz frequency band exceeds what is allowed by the Ordinance. Specifically, the levels allowed in the Ordinance in the 20 Hz to 75 Hz band are 69 dB and the levels which exist in the Petitioners home caused by the Café are 75 dB. (See below) Specifically, the Ordinance provides, “Maximum permissible sound pressure levels at specified points of measurement for noise radiated continuously from a facility between 10:00 p.m. and 7:00 a.m. shall be as follows:

¹ While Mr. Coate conducted his tests prior to 10 p.m. the Petitioner experiences the sound and vibration until the Café closes at 11 p.m. which is beyond the time parameters set forth in the Ordinance. Indeed, as the Café gets busier, the equipment operation appears to grow louder.

Frequency Band (Cycles per second)	Sound Pressure Level (Decibels re 0.0002 syne/CM ²)
20—75	69 [75 Measured]
75—100	54
150—300	47
300—600	41
600—1,200	37
1,200—2,400	34
2,400—4,800	31
4,800—10,000	28

While it is true the sound radiating from the Café equipment ceases around 11 p.m., clearly the point of the Ordinance is to prevent unnecessary disturbance when a person is most likely in a home. Here, the Café equipment is directly on top of the Petitioner's residence. The Petitioner lives in her home all day long. The sound emits all day long and therefore the Board should determine that the excess levels are in violation of the Ordinance.

Mr. Coate also tested the vibration within the Property. While he found that the vibration level did fall below what is perceptible to humans as vibration under the ISO 2631 standard, given the frequency of the pure tone, in direct violation of the Ordinance, it is "discernible to the human sense of feeling" (See Section XI-F). At low frequencies, airborne noise can be perceived as vibration which is in keeping with the Petitioner's experience. The data collected indicates that the 31.5 Hz pure tone is severe since it greatly exceeds the 3 decibel increase standard. As Table 2 and Figure 2 of Mr. Coate's report show the difference or delta between the tone at 31.5 Hz and the next frequency level exceeds the maximum "pure tone" of 3 dB, by between up to 8 dB to 20 dB. Mr. Coate's report states: "At very low frequencies, airborne noise can also be perceived as vibration because of resonances in the human body ((e.g., chest cavity)." This "pure tone" noise is very disturbing to Petitioner. The Petitioner cannot stay for extended periods of time in her home, she suffers from nausea and headaches after being in the home during the operation of the Café. The Café's equipment emits the noise which causes what Petitioner

perceives to be vibration given the frequency for “...for three minutes or more in any hour between 7:00 a.m. and 7:00 p.m., or for thirty (30) seconds or more in any one (1) hour between 7:00 p.m. and 7:00 a.m...” (See Section XI-F). The Petitioner has been denied the reasonable use and enjoyment of her home as a result of the conditions created by the Café in direct violation of the Ordinance.

In short, the testing carried out by City staff did not adhere to the frequency band sound pressure levels set out in Section XI-G of the Ordinance, and for that reason did not demonstrate what proper testing showed to be a clear violation of the Zoning Ordinance. Petitioner respectfully requests that the Board overturn the denial of the Zoning Enforcement Request by the Zoning Enforcement Officer and determine that a Cease and Desist Order be issued to the Café by the Zoning Enforcement Officer until such time as it comes into compliance with the Ordinance.

Should you have any questions or concerns, please contact me at (978) 463-7700.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Lisa L. Mead', with a long horizontal flourish extending to the right.

Lisa L. Mead

Attachment
cc: Client



Lead, Talerman & Costa, LLC
Attorneys at Law

30 Green Street
Newburyport, MA 01950
Phone 978.463.7700
Fax 978.463.7747

www.mtclawyers.com

Newburyport Planning Dept.

JAN 11 2018

RECEIVED

January 11, 2018

Certified Return Receipt Requested
Jennifer Blanchet
Zoning Code Enforcement Officer
City of Newburyport
60 Pleasant Street
Newburyport MA 01950

RE: Zoning Enforcement Request / Cease and Desist Request / 35 West Row Café & Bar, Newburyport (the "Café")

Dear Ms. Blanchet;

Reference is made to the above captioned matter. In that connection, I represent Frances Gibbons the owner of Unit 7, 1 Inn Street, Newburyport. Ms. Gibbons condominium unit is located in the top floor, including a loft, of the Thorwald Place Condominium located at 31-35 Market Square, Newburyport (the "Condominium Building"). Also, a part of this same Condominium Building is the Café which is located on the first floor of the Condominium Building in Unit 1. Upon information and belief, as part of the renovations of the Café, the owners thereof, caused to be placed upon the roof of the Condominium Building a ventilations system, on, over or near Unit 7. The ventilation system causes significant vibration constantly throughout Unit 7 resulting in damage to my client personally. From the time the ventilation system was installed, when the system is operating at approximately 10:00 a.m. until it is turned off after 11:00 p.m. my client suffers from headaches, nausea and anxiety. The vibrations have caused her to vacate her condominium during these hours to the extent that she can. Despite her attempts to work with the owner of the Café and the Condominium Association, no remedies have occurred, and the system continues to operate and vibrate constantly throughout business hours.

The City of Newburyport Zoning Ordinance ("NZO") section XI-F provides as follows: "No vibration which is discernible to the human sense of feeling for three minutes or more in any hour between 7:00 a.m. and 7:00 p.m. or for thirty (30) seconds or more in any one (1) hour between 7:00 p.m. and 7:00 a.m. shall be permitted. No vibration at any time shall produce an acceleration of more than 0.1 g or shall result in any combination of amplitudes and frequencies beyond the "safe" range of Table 7, U.S. Bureau of Mines Bulletin #442."


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730 Main Street, Suite 1F
Millis, MA 02054
Phone 508.376.8400

Very clearly the running of the ventilation system from the opening of the business to the close of business every day is in violation of section XI-F of the NZO.

Pursuant to G.L. ch. 40A § 7, I hereby request that enforce the zoning ordinance and issue a cease and desist immediately causing the violation to be halted. Please inform us of your enforcement action(s), or your determination that enforcement is not required and the reason(s) therefor, within the fourteen (14) days stipulated in accordance with Section X-C-4 of the NZO and G.L. ch. 40A s.7.

Sincerely,

A handwritten signature in black ink, appearing to read 'Lisa L. Mead', with a long horizontal line extending to the right.

Lisa L. Mead

cc: Client
David P. Reczek, Trustee Thorwald Place Condominium
David Pierre, Manager, Jetico Properties LLC



NYER'S RESTAURANT & SALON
ESTABLISHED IN 1914

NEWBURY FAMILY & REALTY

February 20, 2018

Via Facsimile (978-465-9958) and Federal Express

Jennifer Blanchet
Newburyport Zoning Administrator
Office of Planning and Development
City of Newburyport
Newburyport City Hall
60 Pleasant Street
Newburyport, MA 01950

Frank Giacalone, R.S.
Director of Public Health
Board of Health – City of Newburyport
City of Newburyport
Newburyport City Hall
60 Pleasant Street
Newburyport, MA 01950

**Re: Written Plan of Action – Second Update
Jetico West Row, LLC d/b/a West Row Café & Bar
35 Market Square, Newburyport, Massachusetts 01950**

Dear Ms. Blanchet and Mr. Giacalone:

I write on behalf of Jetico West Row, LLC doing business as "West Row Café & Bar" ("West Row") at the property located at 35 Market Square, Newburyport, Massachusetts 01950 (the "Premises"). This correspondence is a follow up to my January 25, 2018 and February 13, 2018 letters to you (the "Prior Letters").

West Row's written plan of action to investigate the cause of and, to the extent required, provide remediation for any vibrations "discernable to the human sense" for sustained periods of time is updated from my Prior Letters as follows:

My client has engaged Seidman Bros., Inc. to perform the remaining remediation work, which includes:

- (i) Isolator suspension springs. Springs on the rooftop equipment are to be replaced with higher grade springs.
- (ii) Exhaust duct springs. Suspension springs will be added to metal areas which attach the exhaust duct to the building's structure.
- (iii) Fire-rated doors. All clean out access panel doors are to be replaced.

Seidman Bros., Inc. has been instructed to order all parts necessary to perform the work and to commence as soon as possible. They have indicated to my clients that the work will be performed on or before March 16, 2018. To the extent the parts arrive sooner, the work schedule will be updated. As soon as the exact date for work is scheduled, we will update you.

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Jennifer Blanchet
Frank Giacalone, R.S.
February 20, 2018
Page 2

Thank you for your attention to this matter.

Respectfully yours,

JETICO WEST ROW, LLC

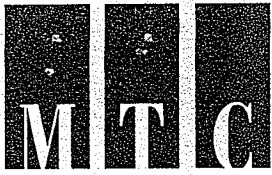
By its Attorneys,

RUBERTO, ISRAEL & WEINER, P.C.

By:


Michael D. Rosen

cc: David Pierre, Jetico West Row, LLC



Mead, Talerman & Costa, LLC
Attorneys at Law

30 Green Street
Newburyport, MA 01950
Phone 978.463.7700
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www.mtclawyers.com

RECEIVED

MAR 26 2018

Newburyport Planning Dept.

March 26, 2018

Jennifer Blanchet
Zoning Code Enforcement Officer
City of Newburyport
60 Pleasant Street
Newburyport MA 01950

RE: Zoning Enforcement Request / Cease and Desist Request / 35 West Row Café
& Bar, Newburyport (the "Café")

Dear Ms. Blanchet;

Reference is made to the above captioned matter and my original request of January 11, 2018. In that connection, as you are aware, I represent Frances Gibbons the owner of Unit 7, 1 Inn Street, Newburyport. Ms. Gibbons condominium unit is located in the top floor, including a loft, of the Thorwald Place Condominium located at 31-35 Market Square, Newburyport (the "Condominium Building"). Also, a part of this same Condominium Building is the Café which is located on the first floor of the Condominium Building in Unit 1.

As expressed in my letter of January 11, 2018, the apparatus which was installed on the roof as part of the improvements to the Café continues to cause noise and vibration in Unit 7 in violation of the Newburyport Zoning Ordinance.

Notwithstanding the owner of the Café's attorney's letter of February 20, 2018, the ventilation system continues to cause significant vibration and noise constantly throughout Unit 7 resulting in damage to my client personally. While it is true that some work was undertaken last week (notwithstanding the assertion that the work was going to be done by March 16, 2018) the vibration and noise continues.

The City of Newburyport Zoning Ordinance ("NZO") section XI-F provides as follows: "No vibration which is discernible to the human sense of feeling for three minutes or more in any hour between 7:00 a.m. and 7:00 p.m. or for thirty (30) seconds or more in any one (1) hour between 7:00 p.m. and 7:00 a.m. shall be permitted. No vibration at any time shall produce an acceleration of more than 0.1 g or shall result in any combination of amplitudes and frequencies beyond the "safe" range of Table 7, U.S. Bureau of Mines Bulletin #442."

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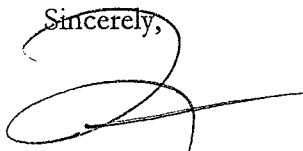
730 Main Street, Suite 1F
Millis, MA 02054
Phone 508.376.8400

Very clearly the running of the ventilation system from the opening of the business to the close of business every day is in violation of section XI-F of the NZO. Further, my client asserts that the ventilation system also violates section XI-G of the NZO.

Pursuant to G.L. ch. 40A § 7, I hereby request that you enforce the zoning ordinance and issue a cease and desist immediately causing the violation to be halted. My client has undergone significant damage since the installation of the ventilation system last fall and has been very patient in hoping for a remedy. Apparently, the remedy has been installed but again results in a violation of the NZO. Ms. Gibbons should not have to suffer through continued violations pending the owner of Unit 1's finding a solution to the problem and violation which he has created.

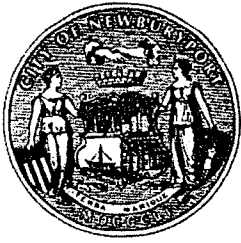
Please inform us of your enforcement action(s), or your determination that enforcement is not required and the reason(s) therefor, within the fourteen (14) days stipulated in accordance with Section X-C-4 of the NZO and G.L. ch. 40A s.7.

Sincerely,

A handwritten signature in black ink, appearing to read 'Lisa L. Mead', with a large, stylized flourish extending to the right.

Lisa L. Mead

cc: Client
David P. Reczek, Trustee Thorwald Place Condominium



CITY OF NEWBURYPORT
OFFICE OF PLANNING AND DEVELOPMENT
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ZONING ORDINANCE ENFORCEMENT REQUEST RESPONSE

To: Frances Gibbons
c/o Lisa Mead, Esq.
30 Green Street
Newburyport, MA 01950

Site: 35 Market Square, West Row Café

Date: April 6, 2018

This memo shall serve as the written response to the Zoning Enforcement Request regarding 35 Market Square, West Row Café, received by the City of Newburyport on March 26, 2018.

The City of Newburyport had previously responded to an initial complaint made January 11, 2018 regarding noise and vibration at 35 Market Square. Noise levels were monitored with equipment from the Mass Department of Environmental Protection and field observations were made regarding the alleged vibration. At that time, the noise levels at one location with the unit were outside of the acceptable range and physical vibration could be felt within Condo Unit 7 at 1 Inn Street. Notice was given to the owner of the equipment believed to be causing the issues and remediation was undertaken.

Since the most recent enforcement request made on March 26, agents from the City of Newburyport have continued to monitor the alleged noise and vibration concerns with the property. On Thursday on March 29th at 3pm I, Jennifer Blanchet, acting in my role as Zoning Administrator, visited condo unit 7 at 1 Inn Street for the purposes of observing the alleged vibrations. During this visit which lasted about 45 minutes, I was not able to personally feel or physically observe vibration that would warrant issuing a Cease and Desist as requested. I also returned to Condo Unit 7 at 1 Inn Street at 8 am on March 30 to observe the conditions. Again, I did not personally feel to the touch any vibration, but I did note that the ambient noise was less at this early morning hour and that the condo occupant did not feel vibration during this visit.

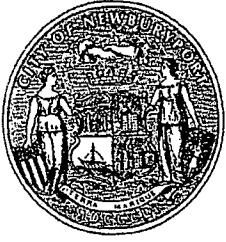
On April 4, 2018 at 2pm I again visited the complainant's condo unit with representatives from the Newburyport Health Department for the purposes of following up on the noise issues that were allegedly associated with the roof top equipment and ductwork for 35 Market Square. New noise readings were taken in the condo unit and compared to the relevant noise level readings prior to remediation as well as to the ambient noise readings for said location. Although still audible the most recent readings fall within the acceptable range and are attached to this response for reference.



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The owner of the restaurant at 35 Market Sq. has contracted with an engineer to design an improved mounting system for the roof top equipment that will hopefully further reduce the noise levels produced in and above the upper level condo units. As sound is produced by the vibration of particles it is hoped that making these additional modifications will further reduce the sound readings and will help Ms. Gibbons' perceived sense of vibration. Therefore, based on the current sound and vibration observations made in Unit 7 of 1 Inn Street, a Cease and Desist order will not be issued to West Row Café at 35 Market Square. If you, or your client, notice that there is a change in the circumstances and would like to request an additional review please feel free to contact the City of Newburyport regarding additional enforcement.

Jennifer Blanchet
Newburyport Zoning Administrator
& Enforcement Officer
978-465-4400 x 1227
Jblanchet@cityofnewburyport.com



CITY OF NEWBURYPORT BOARD OF HEALTH

FRANK GIACALONE, R.S.
DIRECTOR OF PUBLIC HEALTH

NEWBURYPORT CITY HALL • 60 PLEASANT STREET • NEWBURYPORT, MA • 01950
TEL: 978-465-4410 FAX: 978-465-9958
FGIACALONE@CITYOFNEWBURYPORT.COM

Frances Gibbons

1 Inn Street unit #7

Date: 1/16/18	Time: 8:45 am	Date: 1/12/18	Time: 11:40 am	Difference	Date: 4/4/18 2:00 pm	Difference
Ambient data		With hood operating data			Decibel (dB)	
Location of Test	Decibel (dB)	Location of Test	Decibel (dB)		Decibel (dB)	
• Front wall	37	• Front Wall	41	4	36.0	-1
• Front Door	36	• Front Door	40	4	36.5	.5
• Upstairs Corner	37	• Upstairs Corner	40.1	3.1	39.1	2.1
• Bathroom	33	• Bathroom	44.2	11.2	39.4	6.4
• Bedroom	32	• Bedroom	39	7	33.4	1.4
• Kitchen	33	• Kitchen	39	6	36.5	3.5

Testing on 1/16/18 was performed by Frank Giacalone, Director of Public Health and witnessed by Frances Gibbons, owner and Jennifer Blanchet, Zoning Administrator & Enforcement Officer.

- Allowable decibel level is 10 dB above ambient level per Massachusetts Department of Environmental Protection "Noise Policy". Bathroom: $44.2 - 33 = 11.2$ dB (Exceeds allowable by 1.2 dB)

Testing on 4/4/18 was performed by Frank Giacalone, Director of Public Health and witnessed by Frances Gibbons, owner, Jennifer Blanchet, Zoning Administrator & Enforcement Officer and Patty M, office manager.

- Allowable decibel level is 10 dB above ambient level per Massachusetts Department of Environmental Protection "Noise Policy". All areas re-tested are within allowable limit.

XI-F - Vibration.

No vibration which is discernible to the human sense of feeling for three minutes or more in any hour between 7:00 a.m. and 7:00 p.m., or for thirty (30) seconds or more in any one (1) hour between 7:00 p.m. and 7:00 a.m. shall be permitted. No vibration at any time shall produce an acceleration of more than 0.1g or shall result in any combination of amplitudes and frequencies beyond the "safe" range of Table 7, U.S. Bureau of Mines Bulletin #442.

Cross reference— Nuisances, § 8-101 et seq.

XI-G - Noise.

Maximum permissible sound pressure levels at specified points of measurement for noise radiated continuously from a facility between 10:00 p.m. and 7:00 a.m. shall be as follows:

Frequency Band (Cycles per second)	Sound Pressure Level (Decibels re 0.0002 syne/CM ²)
20—75	69
75—100	54
150—300	47
300—600	41
600—1,200	37
1,200—2,400	34
2,400—4,800	31
4,800—10,000	28

If this sound is not smooth and continuous, the following corrections should be added to each of the actual decibels levels given:

- a. Daytime operation only +5
- b. Noise source operates less than 20% of any hour period +5

Cross reference— Nuisances, § 8-101 et seq.



Memorandum

To: Joel Quick, Esq. (Mead, Talerman & Costa, LLC)
CC:
Date: May 2, 2018
From: David Coate
Re: One Inn St. Unit #7 Newburyport, Massachusetts Air Handling Unit Noise and Vibration Measurements

At your request, David Coate Consulting (DCC) conducted noise and vibration measurements within a residence at One Inn Street Unit #7, Newburyport, Massachusetts. The resident has complained about excessive noise/vibration associated with an air handling unit (AHU) recently installed nearby on the roof of the mixed-use building.

Summary

Low-frequency noise (at 31.5 Hz) from the air handling unit is audible throughout the interior of the residence and in excess of Newburyport's noise ordinance spectral limit. In addition, the noise at 31.5 Hz is considered a pure tone, far in excess of MDEP's pure tone noise limit at 310 CMR 7.10. It is important to note that the resident's subjective response (i.e., noise complaint) is consistent with the data collected and violation of both Newburyport and MDEP noise criteria.

At very low frequencies, airborne noise can also be perceived as vibration because of resonances in the human body (e.g., chest cavity). In some cases, low frequency airborne noise can induce vibration in building elements such as floors and walls. In this case, airborne noise is problematic, but measured floor vibration levels are lower than human perception thresholds.

Noise mitigation is outside the scope of our current proposal but means of reducing this noise may include relocation of the AHU, vibration isolation (structure-borne noise/vibration), and/or airborne noise reduction via building sound insulation treatments.

Noise and Vibration Criteria

Table 1 shows the Newburyport noise ordinance (X1-G) maximum sound pressure level limit.

Frequency Band (Cycles per second)	Sound Pressure Level (Decibels re 0.0002 syne/CM ²)
20—75	69
75—100	54
150—300	47
300—600	41
600—1,200	37
1,200—2,400	34
2,400—4,800	31
4,800—10,000	28

Table 1. Newburyport Maximum Sound Pressure Level Limit

Newburyport’s vibration limits (X-1F) are as follows: “No vibration which is discernible to the human sense of feeling for three minutes or more in any hour between 7:00 a.m. and 7:00 p.m., or for thirty (30) seconds or more in any one (1) hour between 7:00 p.m. and 7:00 a.m. shall be permitted. No vibration at any time shall produce an acceleration of more than 0.1g or shall result in any combination of amplitudes and frequencies beyond the "safe" range of Table 7, U.S. Bureau of Mines Bulletin #442.”

By way of reference, the Massachusetts Department of Environmental Protection (MDEP) has outdoor noise criteria at 310 CMR 7.10. MDEP considers a noise source to be violating the regulation if the source

- 1) Increases the broadband sound level by more than 10 dBA above ambient, or
- 2) Produces a ‘pure tone’ condition – when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

MDEP defines “ambient” as the L_{90} , which is the noise level exceeded 90% of the time within a given noise measurement interval.

MDEP noise regulations would be appropriate for measuring noise from a source outdoors and often the noise measurement would be performed at the property line. A 10 dBA increase in noise level above ambient indoors would far exceed an impact level and therefore a threshold of much lower than 10 dBA would be appropriate for an indoor standard. The pure tone criteria are also to be applied outdoors, so in a similar manner exceedance of this criteria indoors would be far in excess of a noise impact.

Noise Measurements

Noise measurements were performed using a Norsonics 118 sound analyzer. This Type I analyzer was calibrated both prior to and after the noise measurements with calibrations traceable to NIST (National Institute of Standards and Technology). Noise measurements were performed in the upstairs bathroom, bedroom, downstairs living room and kitchen while the AHU was running. Figure 1 shows the results of the measurements for comparison with the Newburyport limit.

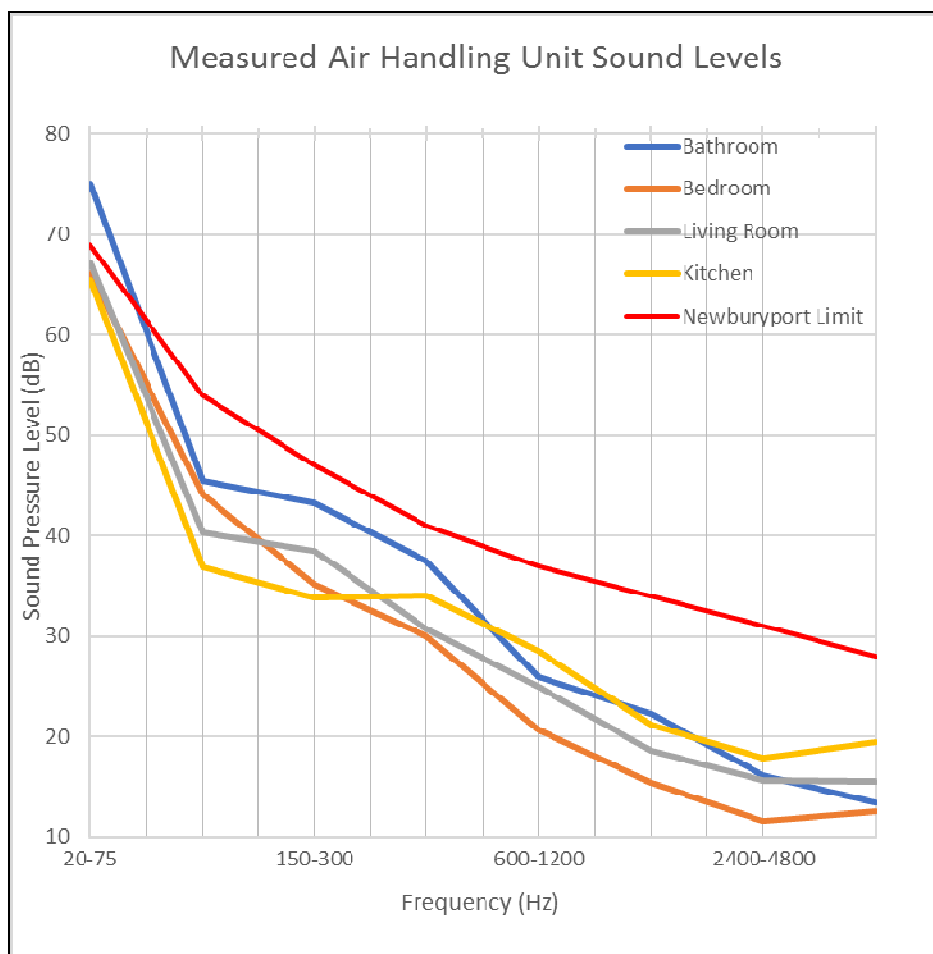


Figure 1. Air Handling Unit Noise Measurements

The 31.5 Hz tone generated by the AHU exceeds the Newburyport limit in the 20-75 Hz band by 6 dB as measured in the bathroom. An exceedance of 6 dB is substantial. Figure 2 shows the same noise measurement data expressed in terms of one-third octave frequency bands- for finer resolution- to show the effects of the AHU sharp peak at 31.5 Hz.

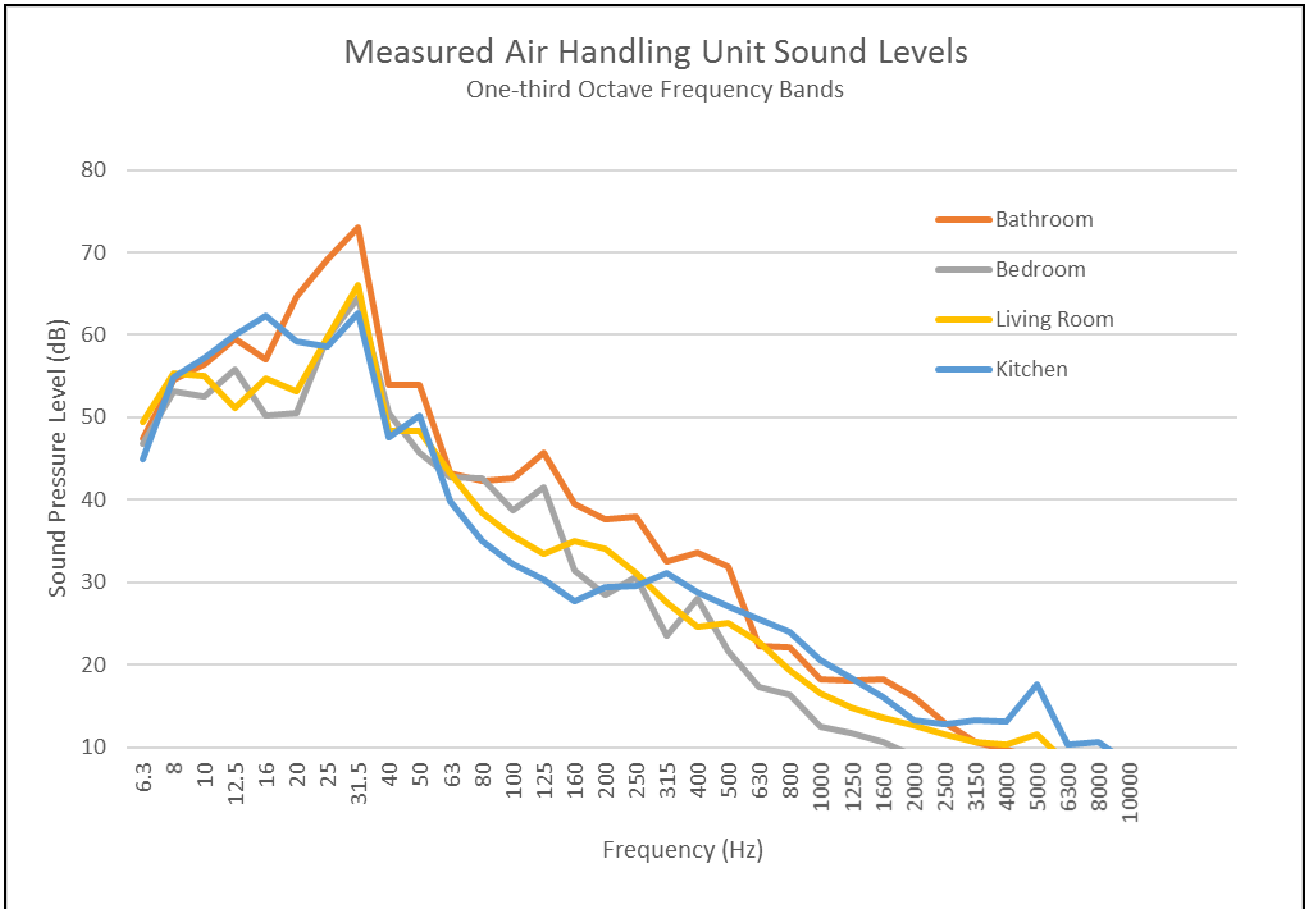


Figure 2. Air Handling Unit Noise Measurements (1/3 Octave Frequency Bands)

Table 2 shows the results of a pure tone analysis of the 31.5 Hz octave band peak. This analysis shows the difference, in dB, between the 31.5 Hz band and adjacent frequency band data. This analysis shows that the 31.5 Hz peak is a pure tone at all locations except for the kitchen. Furthermore, the differences between adjacent bands far exceed the 3 dB threshold requirement, so this is an exceptionally noticeable and intrusive pure tone.

	16 Hz	Delta	31.5 Hz	Delta	63 Hz
Bathroom	66	8	75	20	55
Bedroom	58	8	66	17	49
Living room	58	9	67	17	50
Kitchen	65	-1	64	13	51

Table 2. Pure Tone Analysis Results

The “NC Criteria” are established frequency-based noise criteria which are used to determine the acceptability of noise levels for specific indoor uses. Figure 3 shows the octave frequency band noise measurements for comparison with the NC Criteria. The bathroom part of the bedroom is at NC 40 which is substantially higher than the recommended NC 25-35 for this space.

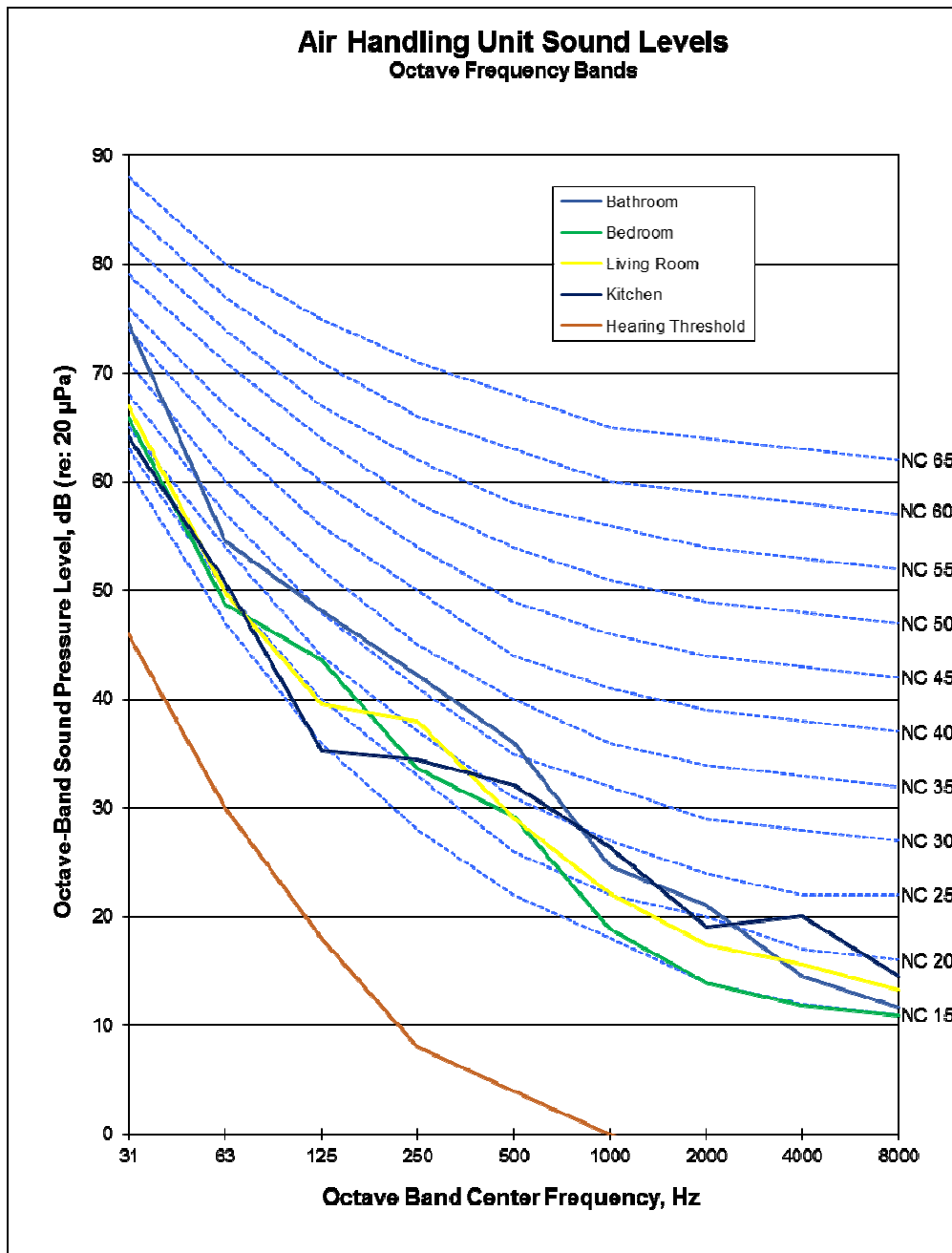


Figure 3. Air Handling Unit Noise Levels Compared with NC Criteria

Vibration Measurements

DCC measured vibration in the floor assemblies at the four noise measurement locations. One-third octave frequency band acceleration data were integrated to vibration velocity and are shown in Figure 4.

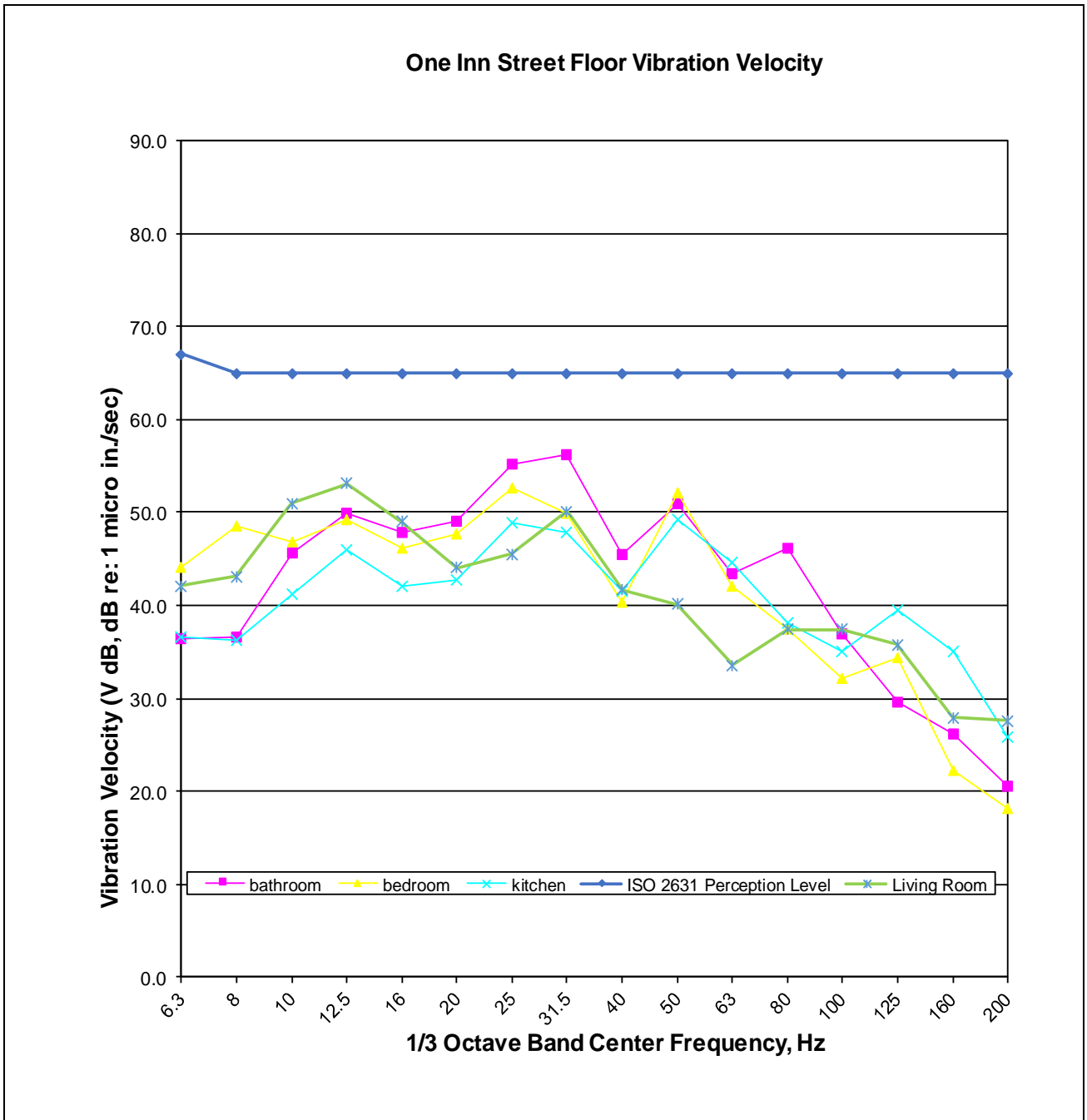
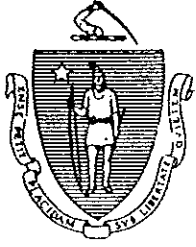


Figure 4. Floor Assembly Vibration Velocity

The 31.5 Hz tone can be seen in this data, likely induced by AHU airborne sound, but all the vibration data are below human perception levels (ISO 2631) and therefore vibration is in compliance with the Newburyport vibration ordinance.



The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Air Quality Control
One Winter Street, Boston 02108

February 1, 1990

DAQC Policy 90-001

DIVISION OF AIR QUALITY CONTROL POLICY

This policy is adopted by the Division of Air Quality Control. The Department's existing guideline for enforcing its noise regulation (310 CMR 7.10) is being reaffirmed.

P O L I C Y

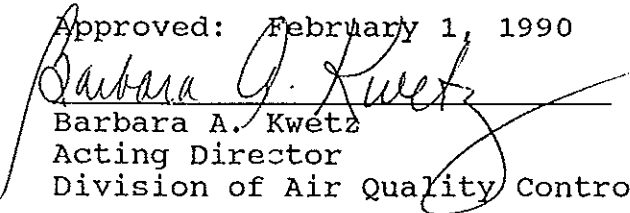
A source of sound will be considered to be violating the Department's noise regulation (310 CMR 7.10) if the source:

1. Increases the broadband sound level by more than 10 dB(A) above ambient, or
2. Produces a "pure tone" condition - when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

These criteria are measured both at the property line and at the nearest inhabited residence. Ambient is defined as the background A-weighted sound level that is exceeded 90% of the time measured during equipment operating hours. The ambient may also be established by other means with the consent of the Department.

Approved: February 1, 1990

Effective: Immediately


Barbara A. Kwetz
Acting Director
Division of Air Quality Control