

# **Report and Recommendations for Revising the Noise Ordinances of Lower Merion Township, Pennsylvania**

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## **Background**

In its December 2011 report “US30 (Lancaster Avenue) Corridor Study: Linkages and Connecting Communities,” the Delaware Valley Regional Planning Commission identified Lower Merion Township as one of five key municipalities for implementing regional planning steps to ensure prosperity and vitality in the western suburbs of Philadelphia. Central to regional planning is the importance of balancing the needs of businesses, homeowners, commuters, consumers, and institutions in fostering a livable environment where people want to be. Regulation of noise is a key element in managing the very diverse subareas of Lower Merion Township.

For many years, Lower Merion Township’s noise ordinances have provided the same standard for all zoning districts, despite wide differences in land use patterns and the expectations of the residents of the subareas. Moreover, the ordinances made a distinction between “continuous” and “sporadic” noise based upon the speed of the measuring device (sound level meter) used to quantify it. In order to update the ordinances to reflect the use of modern equipment and standards, a study was undertaken by students and faculty at Swarthmore College as part of a grant by Lower Merion Township. This report and accompanying recommendations outlines the considerations of the Township for amending those ordinances.

## **Ambient Noise Surveys**

During the Summer of 2014, three ambient noise surveys were conducted in Lower Merion Township to quantify existing noise patterns that would inform discussion on proscribed levels. Maximum noise levels, average noise levels, and levels exceeded cumulatively for one minute in ten were recorded at dozens of locations in the township. The results, shown in Figure 1 and Appendix A, provide an indication of what is the current noise landscape. They also suggest what noise levels represent the reasonable expectations of citizens in Lower Merion Township.

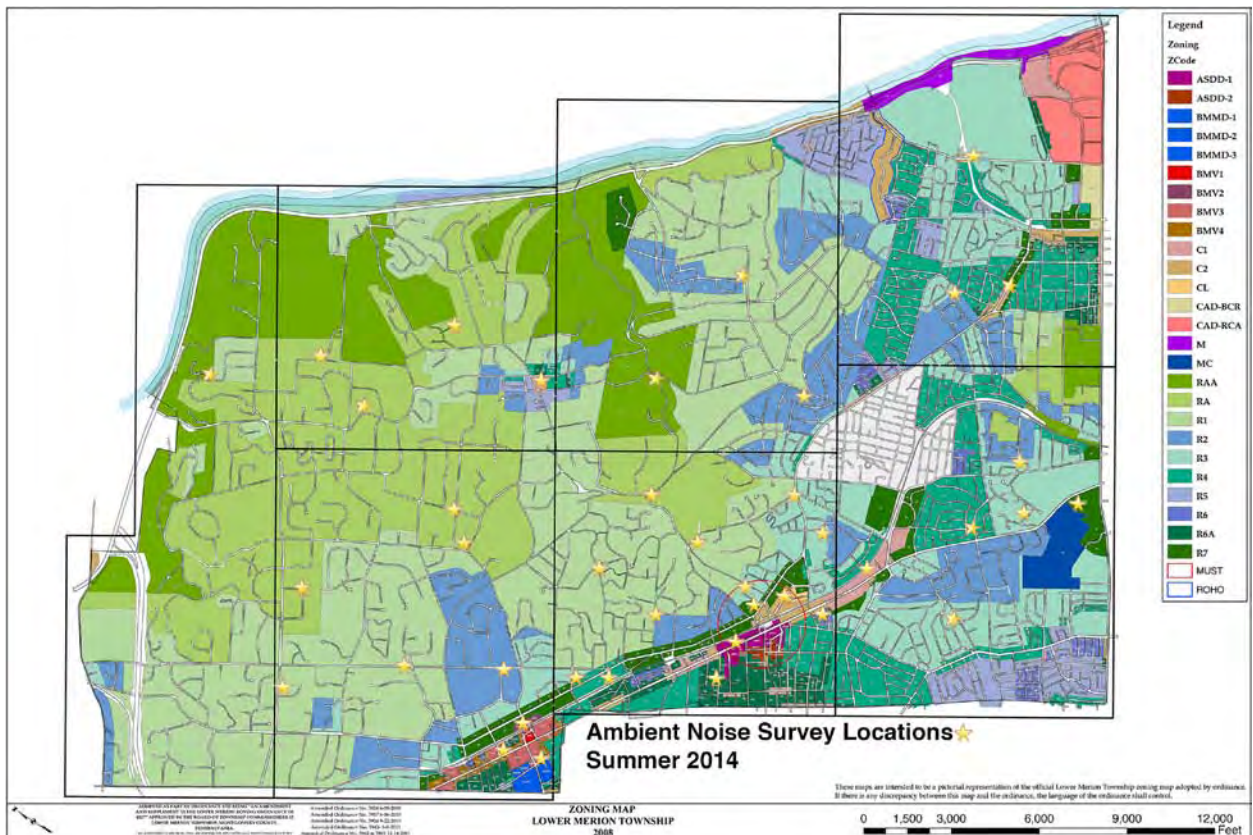
## **Recommended Approach**

The core concepts outlined in the recommendations, Appendix B, are as follows.

1. A-weighted noise levels are the fundamental unit of measurement of noise, rather than the outmoded 600-1200 octave band referenced in the current ordinances. A-weighting is available on all modern meters, and is the basis of standards that relate to community response to noise.
2. The American National Standards Institute, ANSI, promulgates standards for determining the characteristics of equipment, procedures, and definitions related to noise measurement. They are specifically referenced in the recommended revisions.

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3. Rejection of “continuous” and “sporadic” designations for noise. Modern meters measure many noise characteristics simultaneously.
4. No distinction between “inside” and “outside” measurements of noise, but rather a measurement “at the property line” which is generalized to include boundaries between condominium units or between buildings owned by the same landlord.
5. Separate limits for daytime and nighttime noise maximum levels. Community expectations for noise levels have been shown to vary with residents’ sleep patterns.
6. Zoning district distinctions. The diversity of land use categories correlates with zoning districts and allows a balance between protecting the tranquility of residents with the commercial vitality of the many commercial areas in the township. Due to the many zoning categories in LM Township, a distinction is made between residential zoning (all types) and non-residential zoning districts (all types).
7. Maximum and average descriptors. The current ordinance regulates only instantaneous maximum noise levels, but limits placed on average levels ensure that single noise events must occur infrequently for the average not to exceed the specified level. Many modern sound level meters provide maximum and average sound pressure levels.
8. Disorderly conduct provision. This provision is retained because it is a useful tool for police enforcement, but as a qualitative standard should be used sparingly. For example, traffic noise is exempted from Section 105 but operators of individual loud vehicles could be cited under the disorderly conduct provision.



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Figure 1: Noise Survey Locations, Summer 2014

**Proposed Ordinance Revisions with Commentary**

**§ 105-1. Definitions.**

The following words and terms, as used herein, shall have the following meanings:

**CONTINUOUS NOISE --**

A noise which normally continues for a period of time necessary for an operator of a sound level meter and associated band analyzer to obtain accurate readings in all frequency bands, as set forth in the tables in §105-3 hereof.

The concept of continuous noise is problematic because there is a continuum between steady noise and interrupted noise. The definition is not helpful because it depends on the quality of the sound level meter used to measure the sound. In particular, modern computer-based sound level meters can provide levels in all frequency bands instantly. Furthermore, in modern published studies there is no premium in perceived annoyance for a continuous sound, all other qualities being equal. White or pink noise is sometimes intentionally applied in open-plan office settings to mask speech and the perception is that the office is quieter and less distracting, even though more noise energy is present. This definition is therefore outmoded and is recommended that it be removed from the ordinance.

**DAYTIME HOURS --**

The hours between 7:00 a.m. and 11:00 p.m.

Many other municipalities have gradually shifted to a definition of Daytime Hours that begin at 7:30 am rather than 7:00 am, on weekdays and 8:00 am on weekends and municipal holidays. While some municipalities have also shifted to 10 pm to begin Nighttime Hours, LMT residents we interviewed expected 11 pm to remain appropriate.

**DIRECTOR --**

The Director of the Building and Planning Department of the Township.

**NIGHTTIME HOURS --**

The hours between 11:00 p.m. and 7:00 a.m.

Again, the shift from 7:00 am to 7:30 am has been embraced as more beneficial to more residents, while still allowing commerce and construction activities to begin.

**PERSON --**

Any individual, firm, corporation, association or partnership.

**SPORADIC NOISE --**

Any noise which does not normally continue for a period of time necessary to obtain decibel readings in all frequency bands.

Because this definition depends upon the quality of the sound level meter, and because modern sound level meters can measure decibel readings in all frequency bands essentially simultaneously, this definition is outmoded. Most municipalities do not make a distinction between the regulation of continuous or sporadic noise, but focus on other characteristics of the noise that correlate better with annoyance. This definition is therefore outmoded and I recommend that it removed from the ordinance.

Other definitions that would be recommended for inclusion in this section:

A-weighted Sound Pressure Level (SPL) – the logarithmic sum of octave band sound levels obtained after applying a series of calibration factors to the sound pressure level in each octave band, as specified by ANSI Standard S1.42, measured with a Type I or Type II sound level meter using the A-weighting network. The level so read is designated as dBA.

Decibel (dB) - A unit for measuring the sound-pressure level, equal to twenty (20) times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is twenty (20) micropascals or 0.0002 microbar.

Equivalent Continuous Noise Level “Leq” – The sound pressure level in dBA equivalent to the sound energy over a given period of time, calculated as the numerical average of dBA readings taken continuously over the time interval. For the purposes of this ordinance, the time interval over which the time-averaged level is to be calculated is at least 10 minutes.

Octave band – a portion of the sound spectrum with the upper limit twice the frequency of the lower limit. Octave bands are named for their center frequency (geometric mean) of the band. Standard octave bands for sound level meters are defined in ANSI S1.11.

Property line - An imaginary line drawn through the point of contact of adjoining lands, apartments, condominiums, townhouses and duplexes owned, rented or leased by different persons, a demarcation or a line of separation of properties and also, for any two (2) or more buildings sharing common grounds, the line drawn midway between any two (2) said buildings.

All terminology used in this chapter not defined below shall be in conformance with the applicable publications of the American National Standards Institute [ANSI S1.1-1960 (R1971) and its revisions] or its successor body.

**§ 105-2. Excessive noise prohibited.**

It shall be unlawful for any person, in the operation of an air-conditioning unit or units and equipment or other types of mechanical equipment or apparatus installed in or attached to buildings or located on premises appurtenant to buildings, to make or produce excessive noise, thereby causing annoyance, inconvenience or detriment to the public or to any other person or persons. Noise shall be considered excessive if the sound pressure from the air-conditioning unit or units and equipment or other type of mechanical equipment or apparatus exceeds the limits hereinafter set forth.

The restriction of excessive noise to air-conditioning units and other types of mechanical apparatus attached to buildings is overly restrictive. A modern trend is to regulate the noise by its characteristics, irrespective of its source. Therefore 105-2 may be re-written as:

It shall be unlawful for any person to make or produce excessive noise, thereby causing annoyance, inconvenience or detriment to the public or to any other person or persons. Noise shall be considered excessive if the sound exceeds the limits hereinafter set forth.

**§ 105-3. Maximum permissible sound pressure levels.**

During daytime hours, the maximum permissible sound pressure levels at specified points of measurement for continuous noise radiated from premises shall not exceed the following:

Removing the requirement for regulation of continuous noise and using the definition of A-weighted sound pressure level as the fundamental measure of noise amplitude, the ordinance would read:

During daytime or nighttime hours, the maximum permissible sound pressure levels, and average levels shall not exceed the following:

<b>Sound Pressure Level Decibels Re 0.0002 Microbar</b>		
<b>Frequency Band (cycles per second)</b>	<b>Inside Table</b>	<b>Outside Table</b>
20 to 75	73	76
75 to 150	66	69
150 to 300	60	64
300 to 600	55	59

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600 to 1,200	52	57
1,200 to 2,400	50	55
2,400 to 4,800	48	53
4,800 to 10,000	47	52

Distinctions made between noise inside and outside a premises presume a standard of construction that provides a fixed acoustic transmission loss at each noise frequency. Rather, municipalities that regulate noise at the property line of the receiving location provide the opportunity for property owners to enjoy their outdoor spaces or to leave their windows open and still be protected. Absolute maximum decibel values provide protection against single infrequent loud noise events, while the statistical measure of average noise level reduces overall negative community response due to annoyance (ANSI S12.9-1996; see figure).

Furthermore, distinctions based on the zoning district of the receiving property can be used to facilitate commerce while protecting residents. Hence the recommended table of maximum levels:

<b>Maximum A-Weighted Sound Pressure Levels (SPL)</b> <b>7:30 am – 11:00 pm Daytime/11:00 pm – 7:30 am Nighttime</b>		
<b>Zoning District of Receiving Property</b>	<b>Maximum SPL (dBA)</b>	<b>Leq Average SPL (dBA)</b>
Residential (R)	57/52	52/45
Non-Residential (C)	67/62	62/55

During nighttime hours, the maximum permissible sound pressure levels at specified points of measurement for continuous noise radiated from premises shall not exceed the following:

The incorporation into the previous table of day/night limits removes the need for a second table, and therefore it should be removed from the section.

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<b>Sound Pressure Level Decibels Re 0.0002 Microbar</b>		
<b>Frequency Band (cycles per second)</b>	<b>Inside Table</b>	<b>Outside Table</b>
20 to 75	69	76
75 to 150	62	69
150 to 300	56	64
300 to 600	50	59
600 to 1,200	47	57
1,200 to 2,400	45	55
2,400 to 4,800	43	53

When the source of complaint originates inside of a building or structure, the microphone shall be placed three feet from the nearest window in the room where the source of complaint originates and not less than three feet above the floor, in which case the inside table of sound pressure levels shall be used.

When the source of complaint originates outside, the microphone shall be placed at the source of the complaint but no closer than three feet to any wall and not less than three feet above the ground, in which case the outside table of sound pressure levels shall be used.

If, as a result of such test, the air-conditioning unit and equipment or other mechanical equipment or apparatus is found to violate the provisions of this chapter, the operation thereof shall forthwith be discontinued and not be resumed unless and until proper corrections have been made therein, which shall first have been approved by the Director.

The three provisions place restrictions on the measurement locations depending upon the origination of the complaint. Rather, the provisions can be collapsed into one text, which could be used in place of the following section 105-4:

§105.4 Noise measurement locations.

Noise measurements should be made on the receiving property within ten feet from the property line nearest the noise source, at least five feet from any structure that reflects sound, and at least three feet above the ground.

**§ 105-4. Sporadic noise.**

No person shall create any sporadic noise which, when measured in the frequency band of 600 to 1,200 cycles per second, exceeds a sound pressure level of 57 decibels during daylight hours or 52 decibels during nighttime hours.

The frequency band between 600 to 1,200 cycles per second (Hz) is outmoded and unavailable on modern sound level meters; there is evidence that frequency components outside of this range are important to reducing speech intelligibility or causing annoyance. The A-weighted Sound Pressure Level is a more appropriate metric, and more easily measured. Whether the sound is intermittent or continuous does not greatly affect listeners' perceptions of whether noise is considered highly annoying, but rather the noise level's contrast with background noise levels. Thus this provision can be removed from the statute.

**§ 105-5. Measurement instrument.**

Sound levels shall be measured with a sound level meter and associated octave band analyzer manufactured according to standards prescribed by the American Standards Association.

Reference should be made to the appropriate modern standard, as shown below:

Sound pressure levels shall be measured with a sound level meter that meets or exceeds the requirement for a Type I or Type II sound-level meter as specified in ANSI Specification S1.4-1974 or its successor. The manufacturer's published indication of compliance with such specifications shall be prima facie evidence of such compliance.

**§ 105-6. Exemptions.**

Traffic noises, noises created by governmental units and noises created by emergency and civil defense activities shall be exempt from the application of this chapter.

Noises created by construction work and the repair and maintenance of any building or structure shall be exempt, but only during the hours of 8:00 a.m. to 6:00 p.m.

The construction exemption should be harmonized with suggested ordinance changes by beginning at 7:30 am (when Daytime Hours start) rather than 8:00 am and include weekends and holidays. Similarly, landscaping activities could be included in the same



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exemption for the same reasons (i.e. the necessity to mow lawns or blow leaves/snow during Daytime hours and on weekends/holidays).

Other municipalities list additional exemptions. For example:

Band concerts, block parties, church carnivals or other performances or similar activities publicly or privately sponsored and presented in any public or private space outdoors shall be exempt from the provisions of this chapter provided that:

- (1) Such activities do not produce sound fifteen (15) dB(A) in excess of the sound levels set forth in Section 105-3; and
- (2) Such activities do not occur between the hours of 10:00 p.m. and 7:30 a.m.

Warning devices: sounds made by warning devices operating continuously for three (3) minutes or less, except that in the event of an actual emergency, the time limitation shall not apply.

### **§ 105-7. Violations and penalties. [Amended 9-21-1977 by Ord. No. 1802; 8-3-1988 by Ord. No. 3104]**

Any person who shall fail to comply with any of the provisions of this chapter shall be liable, on conviction thereof, to a fine or penalty of not less than \$25 nor more than \$1,000 for each offense. Whenever such person shall have been notified by the Director or by the service of a summons in a prosecution or in any other way that he is committing a violation of this chapter, each day in which he shall continue such violation after notification shall constitute a separate offense, punishable by a like fine or penalty. Such fines or penalties shall be collected before any District Justice as like fines or penalties are now by law collected.

There is no recommendation in this report for changes of fines and penalties, but there is an opportunity in revising these ordinances for updating these.

### **§ 105-8. Chapter cumulative.**

This chapter shall be cumulative and shall be in addition to other township ordinances and regulations and, in particular, to any ordinance pertaining to disorderly conduct.

Other municipalities include a disclaimer such as:

This chapter and the foregoing penalties shall not be construed to limit or deny the right of the township or any person to such equitable or other remedies as may otherwise be available with or without process of law.

**§ 111-6. Disorderly conduct prohibited.**

Disorderly conduct, within the meaning of this article, shall constitute the making, causing or permitting to be made anywhere in the Township of Lower Merion of any unnecessary noise, clamor, din or other sound tending to disturb the peace and quiet of the community, and the carrying on of any business, trade, transportation, recreation or amusement at a time, in a place or in a manner which causes any unnecessary noise or disturbance; and all such noises and disturbances are hereby prohibited.[\[1\]](#) All noises or other sounds shall be considered to be unnecessary and to constitute disorderly conduct, even though they are no louder than is customary and are the unavoidable sounds or noises attendant upon the ordinary use and occupation of premises, or attendant upon the ordinary operation or performance of business, trade, transportation, recreation or amusement, if they are made on Sunday or on weekdays during hours other than the usual and customary hours for such work or activity. Except in cases of emergency, no person shall carry on any activity at a time or in a manner which causes unnecessary annoyance or disturbs the peace and quiet of the immediate neighborhood.

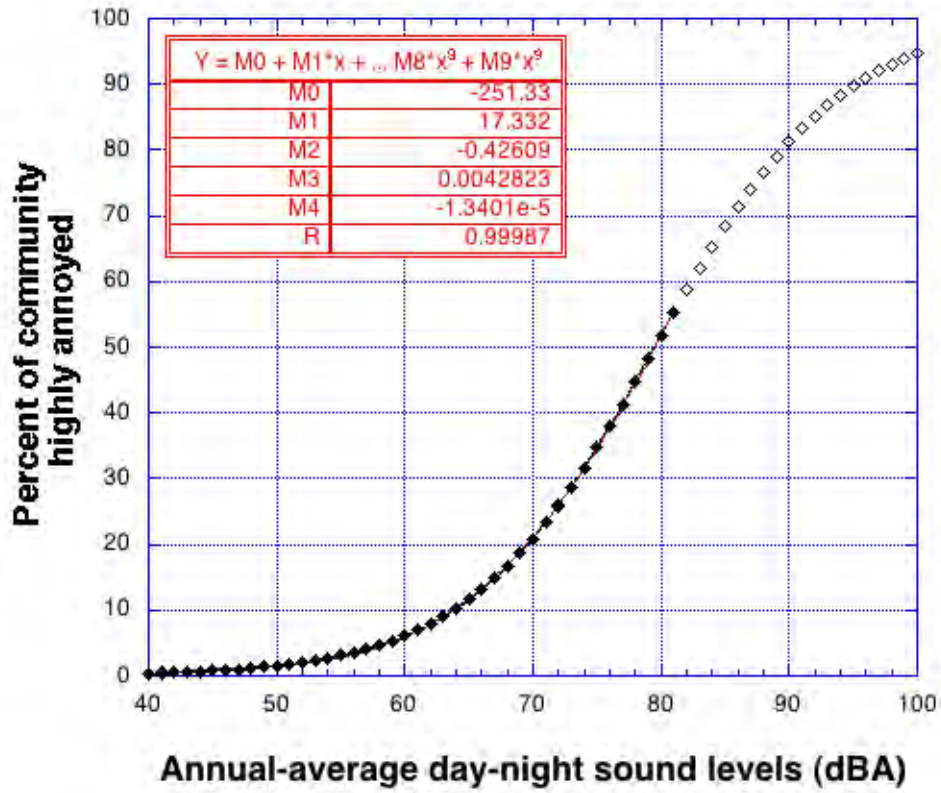
The Disorderly Conduct provision above allows flexibility in enforcement of noise ordinances in unusual circumstances not otherwise anticipated by Section 105. Because of its generality, however, it is subject to challenge and, where possible, the provisions of Section 105 should be used.

**§ 155-188. Sound Level Limitations (Medical Center District).**

Sound levels in this district shall not exceed the background sound level by more than 10 dBA between the hours of 8:00 a.m. and 8:00 p.m. and five dBA between the hours of 8:00 p.m. and 8:00 a.m. when measured from any residentially zoned property immediately outside the district. This section shall not apply to sound levels associated with emergency vehicles, construction noise or emergency generator testing between the hours of 8:00 a.m. and 6:00 p.m., or the use of emergency generators during periods of loss of power.

The shift from 8:00 am to 7:30 am for Daytime Hours should be applied in this District for consistency.

**Annoyance due to Noise (as per ANSI S12.9-1996)**



Location #	Date	Time	Description	Lmax (dBA)	Leq (dBA)
			Montgomery Ave	74.2	69.9
1	7/9/2014	10:46 AM	Ave		
2	7/9/2014	11:20 AM	Residence	54.8	52.4
			Montgomery Ave	75.7	72.2
3	7/9/2014	10:22 AM	Ave		
			Montgomery Ave	73.3	71.3
4	7/9/2014	10:50 AM	Ave		
			Montgomery Ave and Haverford Station Rd	70.1	64
5	7/9/2014	11:10 AM	Station Rd	70.2	64.4
			Haverford Station Rd		
6	7/9/2014	11:25 AM	Station Rd	64	55.9
			Haverford Station Rd		
7	7/9/2014	11:43 AM	Station Rd	71	66.1
			W. Lancaster Ave		
8	7/9/2014	10:41 AM	LM HS neighborhood	50.3	47.7
			LM HS neighborhood		
9	7/9/2014	10:57 AM	LM HS neighborhood	47.8	46.7
			LM HS neighborhood		
10	7/9/2014	11:12 AM	LM HS	66.8	63.9
11	7/9/2014	11:23 AM	LM HS	56.8	53.3
12	7/9/2014	11:55 AM	LM HS	60.8	57.8
			LM HS neighborhood		
13	7/9/2014	12:04 PM	Suburban Square	61.3	58
			Suburban Square		
14	7/14/2014	1:11 PM	Suburban Square	68.2	63.5
			Suburban Square		
15	7/14/2014	1:37 PM	Suburban Square	73	66.5
			Suburban Square		
16	7/14/2014	1:44 PM	St. James Place	65.3	62.5
			St. James Place		
17	7/14/2014	1:56 PM	Place		

			Anderson &	69	67.2
18	7/14/2014	2:04 PM	Montgomery Nellie	70.2	65.1
19	7/14/2014	1:17 PM	Burman		
20	7/14/2014	1:27 PM	residence	44.2	42.1
21	7/14/2014	1:48 PM	residence rural	42.4 38.1	38.5 33.9
22	7/14/2014	1:55 PM	intersection		
23	7/14/2014	2:09 PM	rural road Medical	39.9 66.4	37.4 63.2
24	7/14/2014	1:15 PM	Center		
25	7/28/2014	4:55 PM	Phils CC Ithan Ave	49.2 41.1	44.3 39.3
26	7/28/2014	5:11 PM	residence		
27	7/28/2014	5:32 PM	Morris Ave LeveringMill Rd & Meeting HouseLn	55.3 38.5	47.8 36.6
28	7/28/2014	5:48 PM			
29	7/28/2014	4:26 PM	cemetary Wynnewood	41.9 42.2	38.6 40.1
30	7/28/2014	4:38 PM	Ave		
31	7/28/2014	5:05 PM	Fairview Rd Merion	38.4 40	33.9 37.9
32	7/28/2014	9:11 PM	Square Rd Righters Mill Rd	36.3	35
33	7/28/2014	9:29 PM			
34	8/11/2014	9:44 PM	Monk Rd Youngsford	41.2 40.7	38.3 35.8
35	8/11/2014	10:04 PM	Rd		
36	8/11/2014	10:15 PM	Colton Rd	48.2	41.8
37	8/11/2014	10:22 PM	Mt. Pleasant	39.9	36.7
38	8/11/2014	10:42 PM	Barberry Old Gulph	39.4 45.5	33.7 39.3
39	8/11/2014	9:33 PM	Rd Morris Ave	50.7	46.2
40	8/11/2014	9:45 PM	& Old Gulph Williamson	46.6	43.2
41	8/11/2014	10:01 PM	Rd		