Air Quality Associates
574 Boston Road, Suite 14
Billerica, MA 01821
Phone (978) 436-9994
Fax (978) 436 -9993

October 8, 2015

John Foresto, Chair
Medway Board of Selectmen
155 Village Street, Medway, MA 02053

RE: Air Quality Regulatory Review of the Proposed Exelon Expansion

Dear Mr. Foresto:

I was contracted by the Town of Medway to review and provide comments regarding projected air emissions from the proposed Exelon addition of two 100 MW turbines at the existing West Medway Generating Station site. The existing power plant has six oil-fired combustion turbine generators (yielding 135 MW) and the expansion will add two more natural gas and oil-fired combustion turbine generators. The new plant will be highly efficient for a dual-fueled quick-start plant. I have provided assistance to citizens groups in the past on air quality issues regarding proposed and existing projects, including McFarland Cascade, Billerica, MA; the proposed Billerica Energy Center 348MW peaking power plant; and the proposed Newport Materials asphalt plant, Westford, MA.

In order to assess air quality regulatory compliance of the proposed project, I have reviewed several documents including the following:

1. Energy Facility Siting Board (EFSB) Air & Public Health Sections of Exelon Petition, Sections 1.6.3, 2.2, 4.2, 4.7, 4.10, and Appendix B Air Quality Modeling Protocol;
2. Exelon responses to EFSB and Medway Information Requests on air emissions and public health;
3. Tetra Tech's draft report on the Exelon Petition and Responses to EFSB;
4. West Medway II Major Comprehensive Plan Approval (CPA) Application - Transmittal # X265409;
5. West Medway II Prevention of Significant Deterioration Permit Application; and
6. Electronic air quality modeling files included with Items 4 and 5.

I reviewed these documents and electronic files in order to determine if the proposed facility will comply with all relevant air quality regulations and guidelines.

<u>Air Dispersion Modeling</u>

Air dispersion modeling is the primary means to determine if a proposed facility or proposed addition to an existing facility will cause or contribute to air pollution in the vicinity. Five years of local meteorological data is used in the analysis in order to incorporate predominant wind directions. Emission rates modeled are the maximum potential emissions to ensure that the air quality will be protected under a range of meteorological conditions. For an easy-to-understand summary of air

dispersion modeling, please refer to the Minnesota Pollution Control Agency's "Citizens' Guide to Air Dispersion Modeling[1]."

The air dispersion modeling files were reviewed to determine if the operation of the new combined facility would cause or contribute to a violation of the National Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) Increments, which are shown in Table 1. The Significant Impact Levels (SILs) are also shown in Table 1. If the modeled impacts from the proposed addition are below the SILs, the impacts to air quality are assumed to be "insignificant" and no further modeling is required. The modeled impacts plus the existing background must be below the NAAQS for all pollutants and below the PSD increments for those pollutants that are subject to PSD review. For the proposed Exelon expansion, the following pollutants must also comply with the PSD increments: PM_{10} and $PM_{2.5}$. The Massachusetts Department of Environmental Protection (MassDEP) also has guideline levels for toxic air pollutants[2]. Emissions of toxic air pollutants were also modeled and compared to these guideline values. For more information on toxic air pollutants, see the United States Environmental Protection Agency (US EPA) website[3].

Table 1. NAAQS, PSD Increments and SILs ($\mu g/m^3$)

Pollutant	Averaging Period	Primary NAAQS[4]	Class II PSD Increment Standards	Class II SIL
Particulate Matter less than 10 microns (PM_{10})	24-Hour	150	30	5
	Annual	-	17	1
Particulate Matter less than 2.5 microns ($PM_{2.5}$)	24-Hour	35	9	1.2
	Annual	12	4	0.3
Nitrogen Dioxide (NO_2)	1-Hour	188	-	7.5
	Annual	100	25	1
Sulfur Dioxide (SO_2)	1-Hour	196	-	7.8
	3-Hour	-	512	25
	24-Hour	-	91	5
	Annual	-	20	1
Carbon Monoxide (CO)	1-Hour	40,000	-	2,000
	8-Hour	10,000	-	500

For the cumulative modeling, Exelon included five existing background sources to determine the combined impacts. Cumulative modeling was required for 24-hour PM_{10}, 24-hour $PM_{2.5}$ and 1-hr NO_2 because the modeling for the proposed facility alone showed results above the SILs.

[1] http://www.pca.state.mn.us/index.php/view-document.html?gid=390
[2] http://www.mass.gov/eea/agencies/massdep/toxics/sources/air-guideline-values.html
[3] http://www.epa.gov/air/toxicair/newtoxics.html
[4] http://www3.epa.gov/ttn/naaqs/criteria.html

I have reviewed the written sections in the CPA and PSD applications regarding air dispersion modeling, the air dispersion modeling electronic files and the subsequent questions from the Town and responses from Exelon. I am satisfied that the modeling was performed according to US EPA and MassDEP guidelines and shows compliance with the NAAQS, PSD increments and air toxic guideline levels.

Air concentration isopleths were provided by Exelon as a response to an Information Request from the Town of Medway as intervenors in the Energy Facility Siting Board approval process. They are included as an attachment to this letter for your review. It should be noted that the concentrations plotted are compliant with the NAAQS and are low compared to the existing background concentrations and the NAAQS. For example, EFSB-A-4(3) shows maximum 24-hour PM_{10} concentrations due to the proposed facility. The plot does not show the concentration that you would expect to see on a given day, but rather is a summary of the highest 24-hour average concentration predicted on every day over 5 years. The maximum predicted 24-hour average concentration at any time at any location over 5 years is 9.09 $\mu g/m^3$ (which occurs on the fenceline to the northeast). The maximum concentrations decrease fairly rapidly as you get further away from the fenceline. The concentrations are low compared to the background of 40 $\mu g/m^3$ and the NAAQS of 150 $\mu g/m^3$. In the attachment, I have added the background concentration and NAAQS to each plot for perspective.

Stack Height

Some concern has been expressed by the Town of Medway regarding the proposed stack height. There are engineering issues with excessively tall stack heights, such as support, back pressure and condensation. The "Good Engineering Practice" (GEP) stack height is defined as the maximum of 65 meters (213 feet) or a formula that is based on nearby buildings width and height (as discussed in Section 6.5 of the CPA application). With stack heights that are above the formula height, "downwash" of pollution (in the cavity region downwind of a building) is not expected to cause excessive ground-level concentrations. For more information on building downwash, please refer to the Missouri Department of Environmental Resources guidance document.[5] The maximum height that is allowed to be entered into an air dispersion model is 65 meters (or 213 feet) – so that facilities will not build excessively tall stacks in order to comply with the NAAQS. It is common practice to use air dispersion modeling in order to determine an appropriate stack height that is protective of the NAAQS and does not cause engineering issues or high costs. The stack height proposed for the new quick-start plant of 160 feet provides adequate dispersion such that the ambient standards are not exceeded and reduces the cost and visual impacts of a taller stack while still meeting the state and local noise limits.

Mobile Source Emissions

Trucks will be entering the facility to deliver fuel oil and aqueous ammonia. As many as 175 trucks per day could enter during a period of oil-firing. The emissions from the trucks (burning diesel fuel and causing fugitive dust emissions) were not included in the modeling analyses. MassDEP does not require that mobile source emissions be included in modeling analyses. MassDEP does not have purview over mobile source emissions. They are limited to regulating stationary emission sources only. Mobile emission sources were included in the modeling for the Newport Materials asphalt plant at the request of the Westford Board of Health and the revised modeling analysis was

[5] http://dnr.mo.gov/env/apcp/docs/bldgdownwashandgep10-29-12.pdf

used in the final Risk Assessment document submitted to the Town of Westford[6]. The Risk Assessment concluded that incremental public health risks from the proposed asphalt plant (including truck traffic) was extremely low. There were approximately 200 trucks per day included in the modeling.

Best Available Control Technology (BACT)/ Lowest Achievable Emission Rate (LAER)

I reviewed the control technology analyses in the CPA and PSD applications and concur that the proposed control technology constitutes BACT for NOx, PM_{10}, $PM_{2.5}$, CO, VOC and GHG (CO2e), SO_2 and sulfuric acid mist and LAER for NO_X. My only comment regarding CO_2 is that currently, the only practical approach to controlling CO_2 from power production is through high efficiency. With higher efficiencies, more electricity can be produced by burning less fuel. A peaking plant is inherently less efficient than a baseload plant, which can use combined cycle technology and recover waste heat. It is my understanding that combined cycle technology cannot be utilized for a 30 minute quick-start peaking plant. Therefore, using the most efficient combustion turbine generator possible would be considered BACT for CO_2 for a peaking plant. In the future, if it is ever possible to design a quick-start plant with heat recovery, this would then be considered BACT for CO_2 for a fossil fuel peaking plant. Although not yet economical, non-carbon based quick-start plants are being developed with intermittent renewable energy sources through the use of batteries[7] and also Solar Thermal Electric Power[8] (STEM) which stores heat from the sun in molten salts and then generates steam and electricity from the salts when it is needed.

Air Monitoring

The Town of Medway inquired about having air monitors installed to ensure the ambient standards are not being exceeded. Post-construction monitors are not required by the US EPA or MassDEP. Air dispersion modeling is relied upon to determine if a particular source will cause or contribute to an exceedance of a standard prior to its being constructed. Air dispersion modeling can predict the concentration over a large area as opposed to a monitor in a fixed location. I concur with the Exelon's response to Information Request Medway-A-9 that if an air monitor were to show an exceedance, it would be difficult to determine the cause of the exceedance from among the many possible emission sources in the area, including vehicles. The facility will install a Continuous Emissions Monitoring System (CEMS) in each of stacks to monitor emissions of NO_X and CO to ensure that the air permit limits are met. The CEMS data will be reported to MassDEP. If all conditions of the air permit are met and the assumptions used in the modeling analyses remain the same, the ambient air quality should remain below the health based standards as modeled. If the final facility equipment or emissions measured from the stack are significantly different from what was proposed, MassDEP would request updated modeling analyses. The Town of Medway could request that Exelon send a letter to the town confirming that the air dispersion modeling analyses are still accurate after the plant is built (i.e. all the assumptions made in the modeling analyses are still valid).

[6] "A Quantitative Assessment of Potential Health Risks Due to Operation of the Proposed Newport Materials Asphalt Plant Westford, Massachusetts",Cambridge Environmental Inc., December 28, 2009
[7] http://spectrum.ieee.org/energywise/energy/the-smarter-grid/time-to-swap-power-plants-for-giant-batteries
[8] http://www.utilitydive.com/news/how-storage-will-shape-the-future-of-concentrated-solar-power/405897/

If you have any questions, please feel free to contact me at (978) 436-9994 or lsantos@airqualityassoc.com.

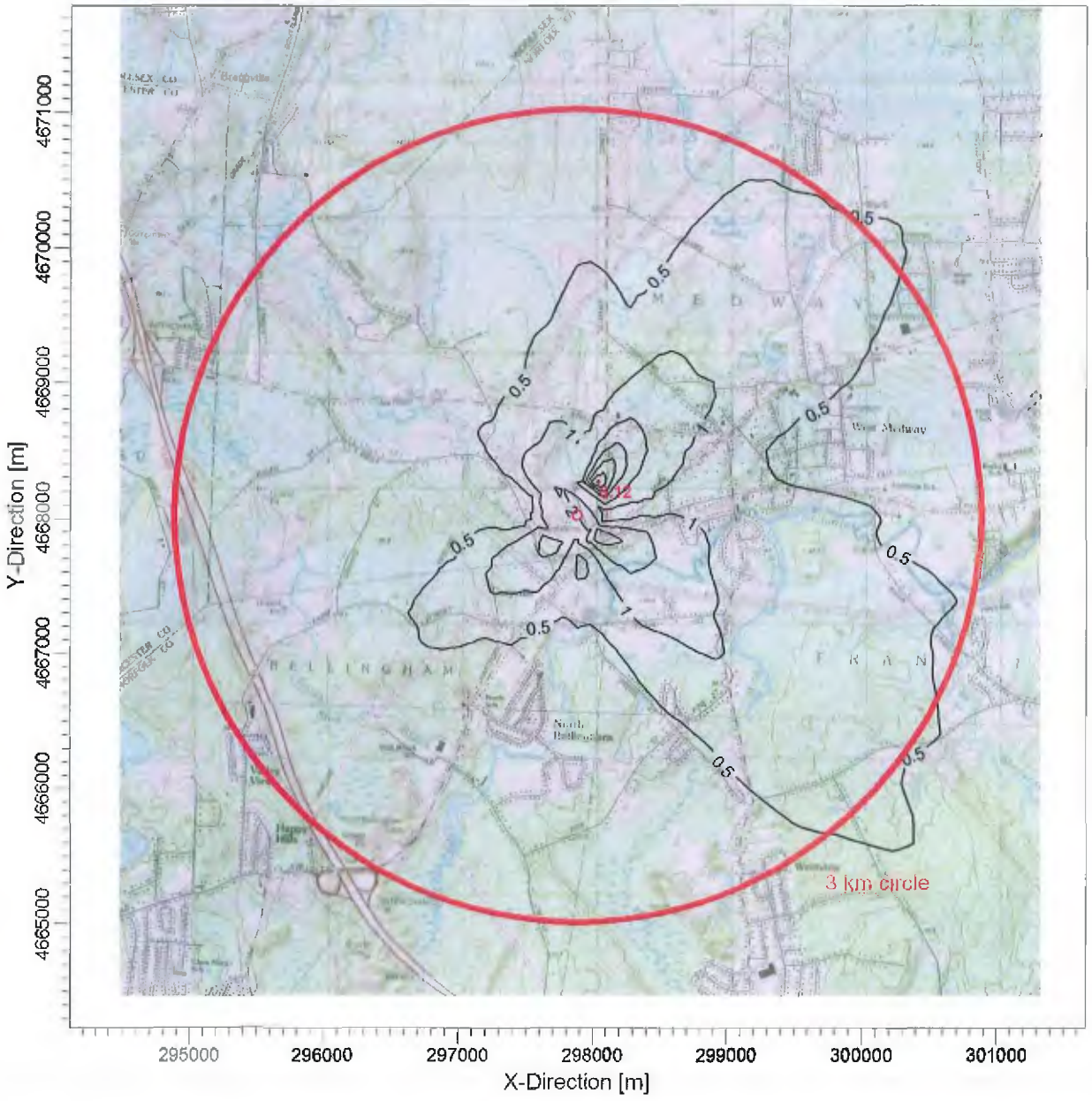
Sincerely,

Lynne P. Santos, P.E.
President, Air Quality Associates
A Woman-owned Business Enterprise
Attachments

Background: 20.7
NAAQS: 35

PROJECT TITLE:

EXELON W MEDWAY NEMA PEAKING PROJ, GEOREF5-13-15 PLAN, 24-HR PM2.5 05/20/15
PLOT FILE OF 1ST-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 5 YEARS FOR SOURCE GROUP: ALLNEW



COMMENTS:	MODELING OPTIONS:		COMPANY NAME:	
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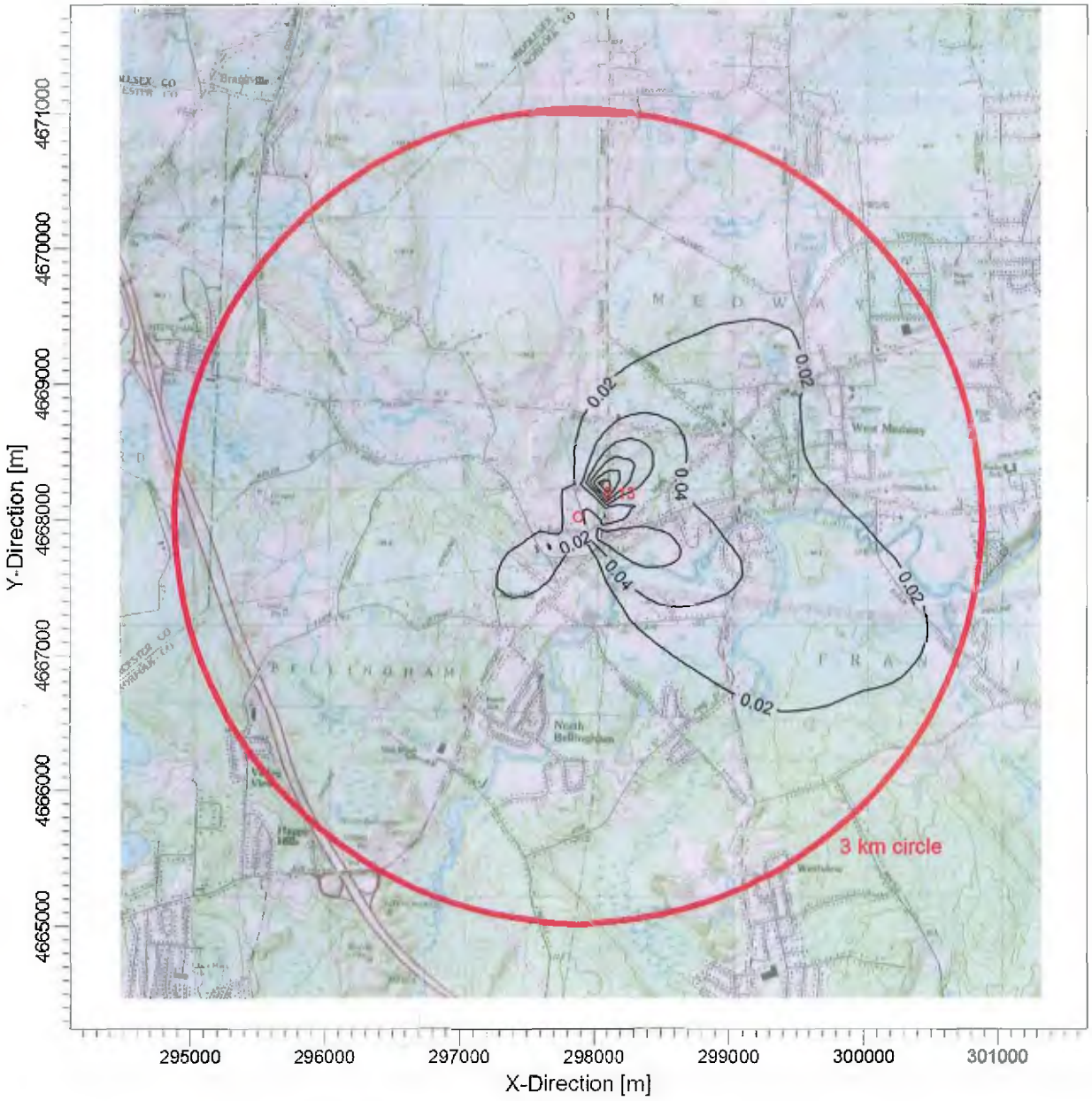
	MAX: **6.119**	UNITS: **ug/m^3**	DATE: **7/15/2015**	PROJECT NO.: **3755**

Background: 8.3
NAAQS: 12

PROJECT TITLE:

EXELON W MEDWAY NEMA PEAKING PROJ, GEOREF5-13-15 PLAN, ANN PM2.5 **07/14/15**
PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALLNEW



COMMENTS:	MODELING OPTIONS:		COMPANY NAME:	
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	Concentration	6079		
	MAX:	UNITS:	DATE:	PROJECT NO.:
	0.1273	ug/m^3	7/15/2015	3755

POST View - Lakes Environmental Software

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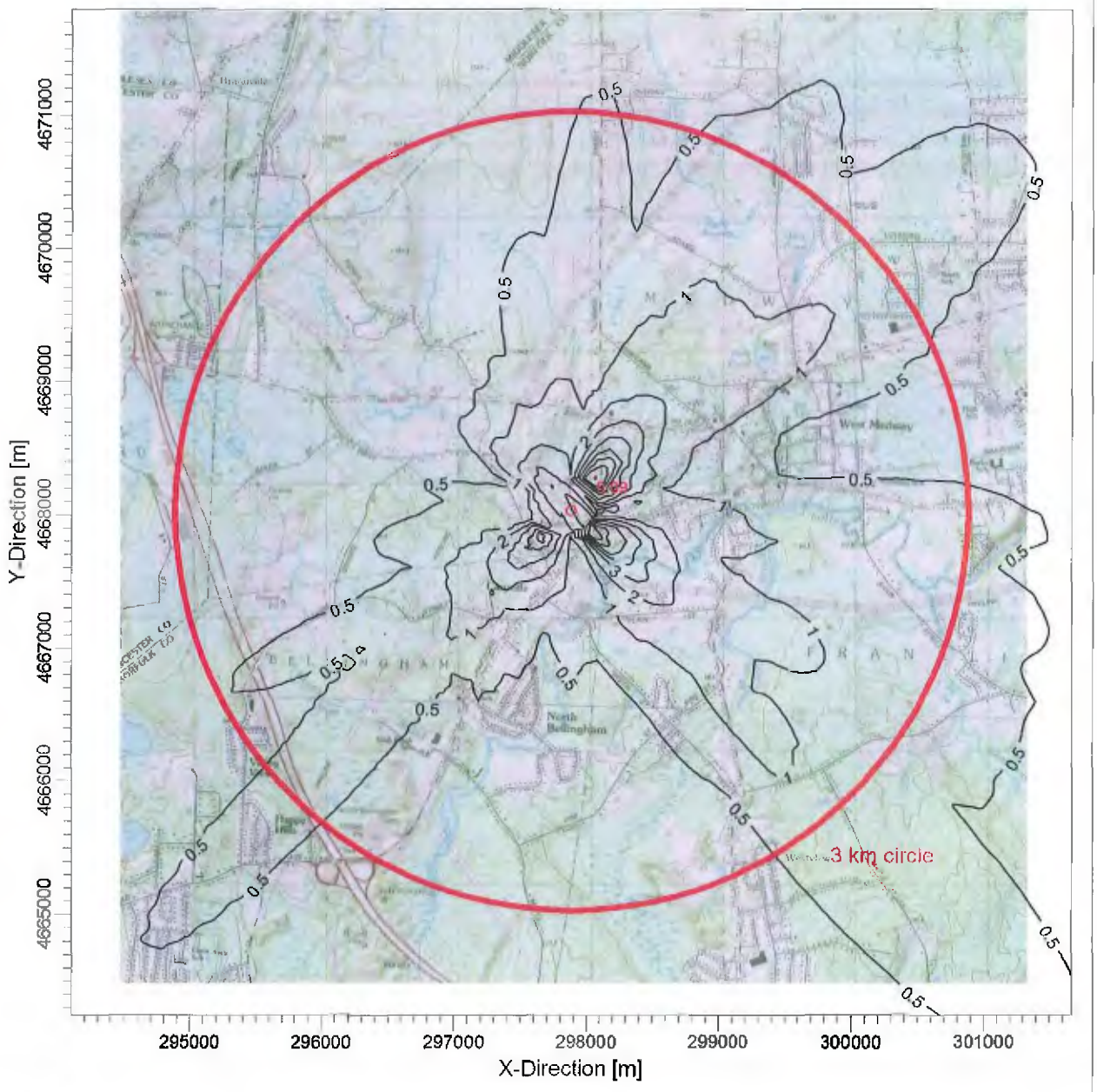
Background: 40
NAAQS: 150

PROJECT TITLE:
EXELON W MEDWAY NEMA PEAKING PROJ, GEOREF5-13-15 PLAN, 24-HR PM10 05/20/15
PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALLNEW



COMMENTS:	MODELING OPTIONS:		COMPANY NAME:	
Maximum 24-hour PM10 (Worst case: March 8, 2012)	**MODELING, OPTIONS, USED:, REGDFAULT, CONC, ELEV**		**Epsilon Associates, Inc.**	
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	MAX: **9.09256**	UNITS: **ug/m^3**	DATE: **7/15/2015**	PROJECT NO.: **3755**

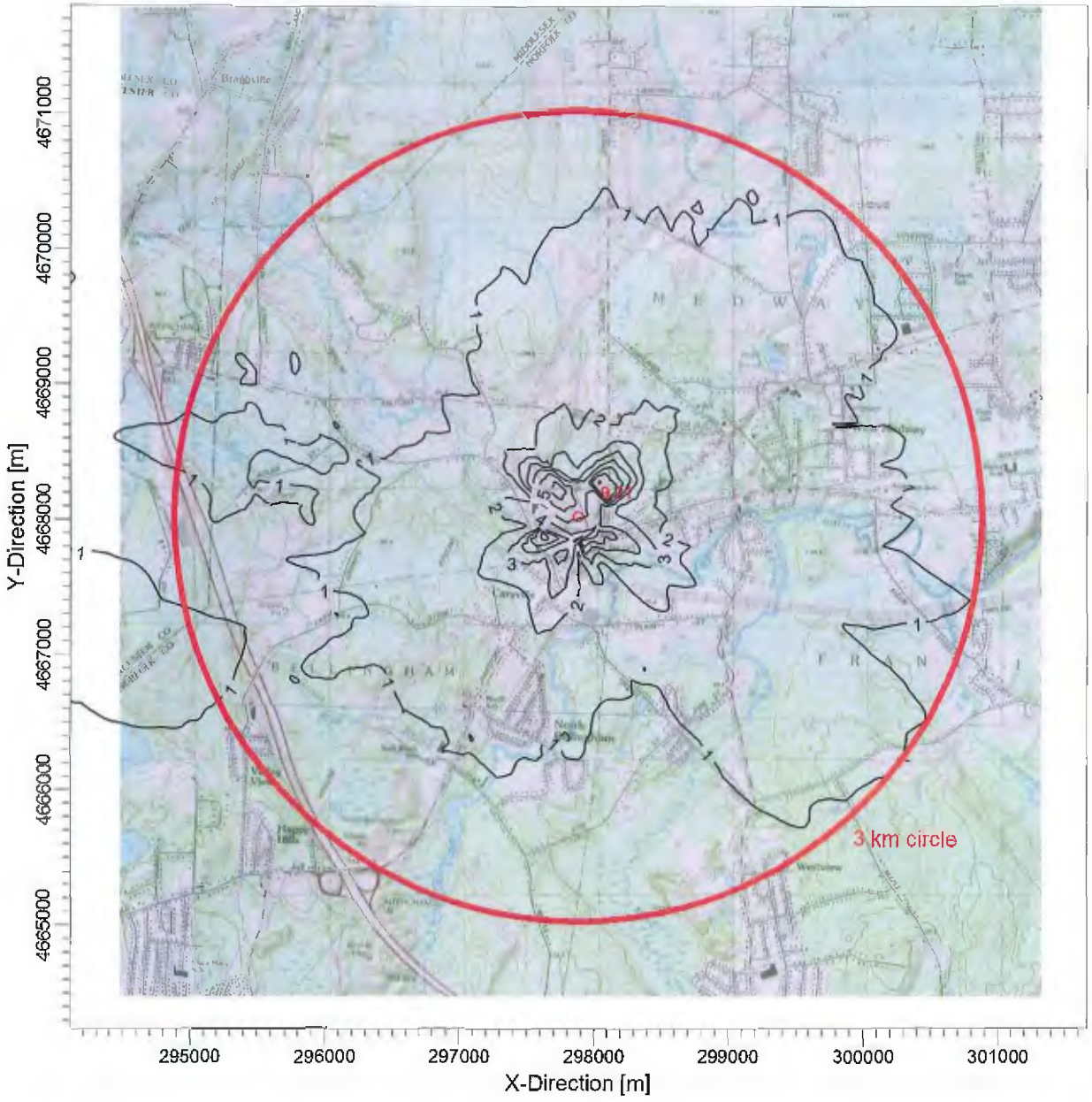
POST View - Lakes Environmental Software

C:\VinsModeling\3755 West Medway\EFSB-RTC Figures\RTC EFSB A-4\Max 24hr PM10\24H1G001.PLT

Background: 97.2
NAAQS: 188

PROJECT TITLE:

W MEDWAY PEAKING PROJ 1-HR NO2 PVMRM, SEASHR BKGRD, 5-13-15 LAYOUT 05/21/15
PLOT FILE OF 1ST-HIGHEST MAX DAILY 1-HR VALUES AVERAGED OVER 5 YEARS FOR SOURCE GROUP: ALLNEW



COMMENTS:	MODELING OPTIONS:		COMPANY NAME:	
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POST View - Lakes Environmental Software

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