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**United States District Court**

**District of Oregon**

**Portland Division**

Civil Action No. 3:11-cv-00739-MO

**AHM**, by and through  
her Guardian *ad litem* and father,  
David Mark Morrison, and  
**David Mark Morrison**, individually,

**Amended Declaration of  
L. Lloyd Morgan, B.S.**

v.

**Portland Public Schools**,  
Defendant.

I, L. Lloyd Morgan, under penalty of perjury pursuant to 28 U.S.C. § 1746, hereby make the following declaration in support of a preliminary and permanent injunction enjoining Portland Public Schools' use of WI-FI:

1. I am an electronic engineer by training (UC Berkeley) with 38 years of industrial experience to the Vice Presidential level (retired 2002).
2. I have a Bachelors of Science, Electronic Engineering, from the University of California, Berkeley.
3. I am prepared to testify about my knowledge of electromagnetic fields (EMFs) and radiofrequency/microwave (RF/MW) radiation in the context of health effects across frequencies from 1 Hz to 300 GHz. WI-FI deploys microwave radiation at a carrier frequency of 2.45 GHz, the same frequency as a microwave oven. WI-FI additionally involves the pulse-modulation of the carrier frequency.
4. I am a member of the international science organizations Bioelectromagnetics Society (see [www.bems.org](http://www.bems.org)), Senior Research Fellow, Environmental Health Trust<sup>1</sup> (EHT) ([www.environmentalhealthtrust.org/](http://www.environmentalhealthtrust.org/)), Scientific Advisor, EM Radiation Research Trust ([www.radiationresearch.org/](http://www.radiationresearch.org/)), an investigator of a childhood leukemia cluster in Fallon, Nevada with a team from the University of California, San Francisco, USA, and a columnist for Powerwatch ([www.powerwatch.org.uk/columns/morgan/index.asp](http://www.powerwatch.org.uk/columns/morgan/index.asp)). For many years I have been a member of the Board of Directors of the Central Brain Tumor Registry of the United States ([www.cbtrus.org](http://www.cbtrus.org)). My participation as an expert witness is not on behalf of any of the above organizations.
5. Since 1995, I have been involved in the study of exposure to electromagnetic fields and radiation and their resultant health problems. Beginning in 1995, each year since 1995, I have attended multiple science meetings including, the Bioelectromagnetics Society, the Neuro-Oncology Society, the American Academy of Environmental Medicine, the 2000 Consensus Conference (to designate all brain tumor types with their appropriate codes), and the Brain Tumor Epidemiology Consortium. I have presented at the Marin County

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<sup>1</sup> A nonprofit organization dedicated to educating individuals, professionals and communities about controllable environmental health risks and policy changes needed to reduce those risks.

(California) Department of Health Services in 2003, the American Academy of Environmental Medicine in 2004, the Bioelectromagnetics Society in 2005, 2008, 2009, 2010 and 2011 (two presentations), the Children with Leukemia conference in 2008, and the Radiation Research Trust (RRT), International Conference, EMF & Health, A Global Issue, in September 2008, and to physicians and health advocate organizations. I incorporate by reference and am prepared to testify regarding the presentations made at the Bioelectromagnetics Society (attached to this Declaration).

6. I authored two legislative Acts concerning brain tumors, one in California (passed into law in 2000), and the other in the US Congress (passed into law in 2002). I currently have another Bill in the US Congress, the National Childhood Brain Tumor Prevention Network Act, mandating a comprehensive study into the causes of the leading cause of cancer death in children: brain tumors.
7. I am a co-author on two previously published, peer-reviewed, epidemiological papers: *Long-term use of cellular phones and brain tumours: increased risk associated with use for > or =10 years.*<sup>2</sup> This paper was awarded ‘one of the top ten articles for 2007’ in the peer-reviewed journal of *Occupational and Environmental Medicine*, <http://oem.bmj.com/misc/topten07.dtl>, and, *A new electromagnetic exposure metric: high frequency voltage transients associated with increased cancer incidence in teachers in a California school.*<sup>3</sup> I am prepared to testify about all the findings of these papers.
8. I authored a science paper *Estimating the Risk of Brain Tumors from Cellphone Use: Published Case-Control Studies* is available from the peer-reviewed journal

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<sup>2</sup> Hardell L, Carlberg M, Söderqvist F, Mild KH, Morgan LL. Long-term use of cellular phones and brain tumours: increased risk associated with use for > or =10 years. *Occup Environ Med.* 2007 Sep; 64(9):626-32.

<sup>3</sup> Milham S and Morgan LL. A new electromagnetic exposure metric: high frequency voltage transients associated with increased cancer incidence in teachers in a California school’ *Am J Ind Med.* 2008 Aug; 51(8):579-86.

Pathophysiology (Pathophysiology. **2009** Aug;16(2-3):137-47. Epub **2009** Apr 7), which reports that the Interphone studies on the risk of brain tumors from cellphone use has a systemic-protective-skew that results in an underestimation of the risk of brain tumors. I am prepared to testify about all the findings of this paper.

9. In November, 2009, I was a distinguished member of a Scientific Panel at the International EMF Conference in Stavanger, Norway: 'Electromagnetic fields and health: Science pointing to new biologically-based guidelines,' whose task was to arrive at new EMF exposure limits based on scientific findings of harm (see 12 below). The findings of the scientific panel were published, and I am prepared to testify about anything in this paper.<sup>4</sup>
10. I incorporate by reference herein and am prepared to testify regarding the reasons given for the Swisscom patent WO/2004/075583, Reduction of Electromog in Wireless Local Networks, 28 April 2004, to reduce power from cordless phones:

Need for patent:

'The risk of damage to health through electromog has also become better understood as a result of more recent studies and improved studies. When, for example, human blood cells are irradiated with electromagnetic fields, clear damage to hereditary material has been demonstrated and there have been indications of an increased cancer risk.'

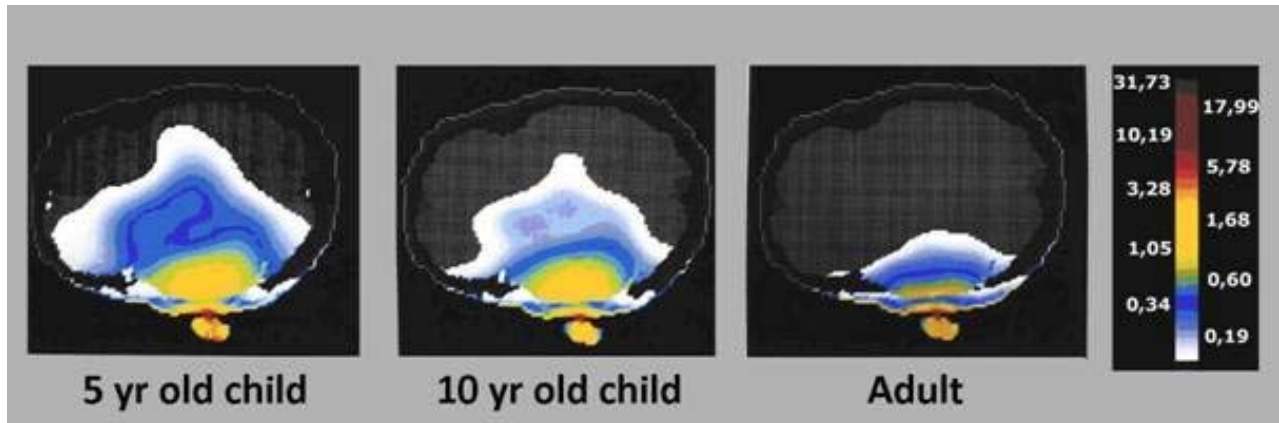
11. I am the lead author of the Report, *Cellphones and Brain Tumors: 15 Reasons for Concern* (<http://www.radiationresearch.org/pdfs/15reasons.asp>), which was widely distributed to the media and government officials August 25, 2009. I am prepared to

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<sup>4</sup> Adamantia Fragopoulou, Yuri Grigoriev, Olle Johansson, Lukas H Margaritis, Lloyd Morgan, Elihu Richter and Cindy Sage. Scientific Panel on Electromagnetic Field Health Risks: Consensus Points, Recommendations, and Rationales. REVIEWS ON ENVIRONMENTAL HEALTH VOLUME 25, No. 4, 2010.

testify about all the findings of this Report including all of the references listed in the Report.

One important graphic I will discuss is presented below. In addition, I am prepared to testify about the significance of funding bias (see page 28).



Depth of absorption of cell phone radiation in a 5-year old child, a 10-year old child, and in an adult from GSM cell phone radiation at 900 MHz. Color scale on right shows the SAR in Watts per kilogram. Gandhi *et al.*, IEEE Transactions on Microwave Theory and Techniques (1996); Quoted from Morgan *et al.*, *Cellphones and Brain Tumors – 15 Reasons for Concern*, at 25 (2009) and Ghandi, Morgan *et al.*, *Exposure Limits: The underestimation of absorbed cell phone radiation, especially in children*, (see 28 below).

11. I provided Technical Commentary (<http://electromagnetichealth.org/wp-content/uploads/2010/12/Lloyd1.pdf>) on the review paper by Hardell *et al.*, *Re-Analysis: Hardell L, Carlberg M, Hansson Mild K. Re-analysis of risk for glioma in relation to mobile telephone use: comparison with the results of the Interphone international case-control study.* Int J Epidemiol 2010; <http://electromagnetichealth.org/electromagnetic-health-blog/swedish-orebro-re-analysed/> (it confirms that design flaws in the Interphone study published in May 2010 caused the risk of brain tumors to be underestimated.) I incorporate by reference herein and am prepared to testify about this re-analysis.
12. Along with co-authors, the recent science paper Scientific Panel on Electromagnetic Field Health Risks: Consensus Points, Recommendations, and Rationales (Reviews on Environmental Health Vol 25, No 4, 2010) calls for new biologically based

exposure limits. It also recommends, based on scientific findings of harm, the lowering of exposure limits. This does not mean that health effects do not occur at EVEN lower exposure levels; rather particularly with increased duration, harmful effects have been found at lower levels yet. I incorporate by reference herein and am prepared to testify regarding all the findings of this paper, including that the current Federal Communications Commission (FCC) exposure limit of 1,000  $\mu\text{W}/\text{cm}^2$  is definitely not safe but rather a harmful level.

13. This year, I submitted an invited public comment, *Why the Switched Telephone Network's Existence Is Essential*, (available upon request), in opposition to the FCC's proposed dismantling ([http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2011/db0209/FCC-11-13A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2011/db0209/FCC-11-13A1.pdf)) of our valuable national Switched Telephone Network.
14. I am an author of the paper, *Exposure Limits: The underestimation of absorbed cellphone radiation, especially in children*, published on-line in the journal *Electromagnetic Biology and Medicine* (2011) available at <http://informahealthcare.com/doi/abs/10.3109/15368378.2011.622827>. I incorporate by reference herein and am prepared to testify regarding all the findings of this paper and the findings of all references cited in this paper.
15. The FCC guidelines, adopted from a Standard of the Institute of Electrical and Electronic Engineers (IEEE), an industry professional organization, are based on a false premise. The FCC performed no independent review, but simply accepted IEEE C95.1-1991, the IEEE standard for safety levels with respect to human exposure to radiofrequency electromagnetic fields. 3 kHz to 100GHz (Replaces ANSI C95.1-1982). The Institute of Electrical and Electronic Engineers, Inc. New York, NY, USA. The false premise is the supposition that the only biological effect of low-level 3 kHz to 100 GHz fields is heating. There is an enormous science literature showing non-thermal (no measurable temperature change) biological effects from exposure to microwave radiation.

16. It should be noted that the commonly used term ‘low-level’ is a physical misnomer, since the ‘low-level’ radiation received, for example, from students near Portland school WI-FI sources is billions to trillions of times higher than natural background radiation at the same frequencies.
17. The FCC is not a typical agency; it is a commission-based agency. *It is not a safety commission. The FCC does not have authority to issue safety standards* or the ability to study and test in the broad area known as the life sciences.
18. *Average* latency time for brain tumors is in excess of 30 years (40 years for atomic bomb survivors). See, for example the Tinea Capitis study by Sadetzki et al.<sup>5</sup> Human epidemiology studies on the risk of brain tumors from cellphone use report a doubling of the risk for brain tumors after 10 or more years of cellphone use (see 23 a & b below). With an average latency time of 30+ years, how could there be an increase after 10+ years? Thirty plus years is an average. Imagine a bell curve where it is highest at 30 years. Tumors diagnosed after 10 years or so would be at the far left of the bell curve. I am prepared to testify about the findings in the Sadetzki et al study.
19. I am prepared to testify regarding Cisco Systems, a manufacturer of WI-FI devices, White Paper: *Wireless Systems and RF Safety Issues* (2005), and its referenced studies, that, upon information and belief, was relied upon by Portland Public Schools when its administrators decided to install and operate WI-FI.
20. **There are a multitude of studies showing harm from microwave radiation.** I incorporate by reference and am prepared to testify regarding all the findings in all the below in paragraphs 23-27 below showing non-thermal (no measurable temperature change) neurologic effects and genotoxic effects, particularly brain tumors and deleterious effects on

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<sup>5</sup> Siegal Sadetzki, Angela Chetrit, Laurence Freedman, Marilyn Stovall, Baruch Modand, and Ilya Novikov. Long-Term Follow-up for Brain Tumor Development after Childhood Exposure to Ionizing Radiation for Tinea Capitis. RADIATION RESEARCH 163, 424–432 (2005).

human and animal sperm, caused by low-level microwave radiation. Though both are microwave exposures, there is an important difference between cellphone exposures and cell tower (base stations) and Wi-Fi exposures. The former is voluntary, intermittent in nature, and considerably higher *rate* of absorption of microwave radiation due to its immediate proximity to the user. The latter is an involuntary, 24/7 exposure, with a much lower *rate* of absorption of microwave radiation due its relative larger distance from the involuntary “user.” However, the cumulative absorption could be similar. For example, if someone uses a cellphone say 1 hour total per day, keeping it off between uses, then if the rate of absorption is from a cellphone is 24 times higher than the involuntary but continuous exposure, then the cumulative absorption would be the same. The importance of distance from the source of the radiation is a critical and I am prepared to testify about the inverse square law which dominates over all other factors the rate of absorption of microwave radiation.

21. **A multitude of studies:** In paragraphs 23 a & b, there are two sets of studies by a Swedish team led by Dr. Lennart Hardell, and by the 13-country Interphone study, one study of children’s use of cellphones (paragraph 23 c), a set of human sperm studies (paragraph 24), a set of animal sperm studies (paragraph 25), genotoxic animal studies (paragraph 25), two studies on the risk of a salivary gland tumor located in the cheek (paragraph 27), a study showing how electronic devices are certified that they meet the FCC exposure limits (paragraph 28), a study that models the incidence of brain tumor into the future (paragraph 29), and a set of studies on Wi-Fi exposure that were the consequence of a British Broadcasting Corporation (BBC) TV showing Wi-Fi microwave radiation levels in a school exceeded cell tower microwave radiation in close proximity to the school (paragraph 30).
22. **The World Health Organization’s (WHO’s) International Agency on Research on Cancer’s (IARC’s) Declaration the Radio Frequency Radiation is a possible human carcinogen.** I am prepared to testify why IARC gave more weight the studies by the



Hardell team than to Interphone studies as well as why the Interphone studies consistently show statistically significant protection from brain tumors for <10 years of use, and consistently significant risk for >10 years of use. I am also prepared to testify about the seminal paper on how to interpret if an exposure in a study can be interpreted as an “association” or a “cause” resulting from effects reported in the study.<sup>6</sup>

**23. Cellphone epidemiological studies:**

- a. Independently funded Swedish studies led by Dr. Lennart Hardell (cellphones and cordless phones):
  - i. Hardell *et al.*, 2006. Pooled analysis of two case-control studies on the use of cellular and cordless telephones and the risk of benign brain tumours diagnosed during 1997-2003.
  - ii. Hardell *et al.*, 2006. Pooled analysis of two case-control studies on use of cellular and cordless telephones and the risk for malignant brain tumours diagnosed in 1997–2003.
  - iii. Hansson Mild *et al.*, 2007. Pooled Analysis of Two Swedish Case–Control Studies on the Use of Mobile and Cordless Telephones and the Risk of Brain Tumours Diagnosed During 1997–2003.
  - iv. Hardell & Carlberg. 2009. Mobile phones, cordless phones and the risk for brain tumours.
  - v. Hardell et al. Pooled Analysis of Case-Control Studies on Malignant Brain Tumours and the Use of Mobile and Cordless Phones Including Living and Deceased Subjects. *Int. J. Oncology* 2011.
- b. Industry funded Interphone studies:
  - i. Lönn *et al.*, 2004. Mobile Phone Use and the Risk of Acoustic Neuroma.

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<sup>6</sup> Sir Austin Bradford Hill. The Environment and Disease: Association or Causation? *Proceedings of the Royal Society of Medicine*. 1965;58:295-300.

- ii. Hepworth et al. 2006. Mobile phone use and risk of glioma in adults: case-control study.
  - iii. The Interphone Study Group. 2010. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study.
  - c. Childhood brain tumor study: Aydin et al. Mobile Phone Use and Brain Tumors in Children and Adolescents: A Multicenter Case-Control Study, *J Natl Cancer Inst* 2011;103:1-13. Also a Correspondence submitted to the *J Natl Cancer Inst*, a commenting on the problems of this study (a proof copy is attached to this Declaration).
24. **Human Fertility Studies:** I incorporate by reference herein and am prepared to testify regarding all the findings of genotoxicity in the Human Male Fertility Studies listed below:
- a. Hardell *et al.*, 2007. Use of cellular and cordless telephones and risk of testicular cancer.
  - b. Agarwal et al. Effect of cell phone usage on semen analysis in men attending infertility clinic: an observational study. *Fertility and Sterility* 2007.
  - c. Agarwal et al. Review, Cell phones: modern man's nemesis? *Reproductive BioMedicine* Vol 18. No 1. 2009 148-157 3 November 2008.
  - d. Avendaño et al. Use of laptop computers connected to Internet through WI-FI decreases human sperm motility (potentially causing infertility) and significantly increases *sperm DNA fragmentation* (potentially being teratogenic, or likely to cause birth defects). *Fertil Steril*. 2011 Nov 22. [Epub ahead of print].
  - e. De Iuliis et al. Mobile Phone Radiation Induces Reactive Oxygen Species Volume 4, Issue 7 July 2009.
  - f. Fejes et al. Is There a Relationship Between Cell Phone Use and Semen Quality? *Archives of Andrology*, 51:385-393, 2005.
  - g. Stanton A. Glantz, *Primer of Biostatistics, Seventh Edition*, Chapter 12, Cell Phones:

25. **Animal Fertility Studies:** I incorporate by reference herein and am prepared to testify on the genotoxicity findings of the Animal studies listed below showing damaged sperm from cellphone radiation:
- a. Aitkin *et al.* Impact of radio frequency electromagnetic radiation on DNA integrity in the male germline. *International journal of andrology*, 28:171–179 (2005);
  - b. Otitolaju *et al.* Preliminary Study on the Induction of Sperm Head Abnormalities in Mice, *Mus musculus*, Exposed to Radiofrequency Radiations from Global System for Mobile Communication Base Stations. *Bull Environ Contam Toxicol* (2010) 84:51–54;
26. **Animal Genotoxic Studies:** I incorporate by reference herein and am prepared to testify regarding all the findings in the Animal studies listed below reporting DNA damage from non-thermal (no measurable temperature change) RF radiation:
- a. Karaca *et al.* The genotoxic effect of radiofrequency waves on mouse brain. *J Neurooncol*, 18 June 2011;
  - b. Philips *et al.* Electromagnetic fields and DNA damage. *Pathophysiology* 2009 Aug;16(2-3):79-88.
27. **Tumors of the Salivary Gland Studies:** I incorporate by reference herein and am prepared to testify regarding all the findings in the studies listed:
- a. Sadetzki *et al.*, 2008 (Israelí Interphone). Cellular Phone Use and Risk of Benign and Malignant Parotid Gland Tumors—A Nationwide Case-Control Study.
  - b. Duan Y, *et al.*, 2010. Correlation between cellular phone use and epithelial parotid gland malignancies.
28. **A Study on How Devices that Emit Radiation Are Certified to Meet Exposure Limits:** I incorporate by reference herein and am prepared to testify regarding the findings in the study mentioned above by Gandhi, Morgan, *et al.*, *Exposure Limits: The underestimation of*

*absorbed cellphone radiation, especially in children*, Electromagnetic Biology and Medicine. In-Press, 12 September 2011.

29. **A Study Prediction the Magnitude of the Future Increase in Brain Cancer:** I incorporate by reference herein and am prepared to testify regarding all the findings of The Potential Impact of Mobile Phone Use on Trends in Brain and CNS Tumors<sup>7</sup>.
30. **Studies Resulting from a British TV Program Reporting Wi-Fi Radiation Was High in UK Schools than Cell Tower Radiation:** Various studies and government documents have focused on WI-FI particularly in schools. In regards to the UK's Health Protection Agency (HPA) reports below, they result from a May 2007 British Broadcasting Corporation, 'BBC One' documentary, *Panorama*, "Wi-Fi, A Warning Signal," where health effects researcher Alasdair Phillip measured WI-FI radiation levels in schools. See parts 1-3 below.
- a. <http://www.youtube.com/watch?v=IuNaDj6VLHw> (part 1);
  - b. <http://www.youtube.com/watch?v=aGplfEnWptk> (part 2); and
  - c. <http://www.youtube.com/watch?v=-VqnPtq4GbU> (part 3).

The above BBC documentary found surprisingly high microwave radiation levels in schools, higher than from a relatively close cell tower, creating the need for further measurements of school radiation. As a result of this BBC TV report, the HPA was funded by the UK government to repeat and verify Alasdair Phillip's measurements. The studies and resultant HPA web pages on WI-FI in schools are listed below. I incorporate by reference herein and am prepared to testify regarding all the findings of these papers, reports and web pages that showed even higher radiation levels in schools than measured in BBC's *Panorama* documentary:

- a. The UK's Health Protection Agency (HPA), 'WiFi – the HPA Research Project.'  
[http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb\\_C/12871426011](http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/12871426011)

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<sup>7</sup> Örjan Hallberg and L. Lloyd Morgan. The Potential Impact of Mobile Phone Use on Trends in Brain and CNS Tumors. Neurology & Neurophysiology (In-Press December 16, 2011).

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- b. The HPA's, Report Wi-Fi in Schools (the HPA measurements reported in 2010 and 2011, made at a cost to the UK taxpayer of some £330,000 GBP, completely support the Alasdair Phillips measurements made (for no payment) on the *Panorama* documentary, despite industry-oriented media condemnation of the program at the time, wherein the media falsely asserted that Phillips' measurements were wrong. The IT'IS Foundation in Zurich, Switzerland and the UK HPA have separately documented WI-FI exposure levels as approximately the same by order of magnitude. [http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1254510618866](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1254510618866).
- c. Peyman *et al.* Assessment of Exposure to Electromagnetic Fields from Wireless Computer Networks (Wi-Fi) in Schools; Results of Laboratory Measurements, Health Physics Society (2011).
- d. Khalid *et al.* Exposure to Radio Frequency Electromagnetic Fields from Wireless Computer Network: Duty Factors of Wi-Fi Devices Operating in Schools. Progress in Biophysics and Molecular Biology 18 August 2011.
- e. Kramer *et al.* Final Report, Development of Procedures for the Assessment of Human Exposure to EMF from Wireless Devices in Home and Office, 29 Jan 2005.
- f. Peyman *et al.* Evaluation of Exposure of School Children to Electromagnetic Fields from Wireless Computer Networks (Wi-Fi): Phase 1 Laboratory Measurements. BEMS Meeting, Seoul, South Korea, June 2010;
- g. HPA Updated Memorandum on Wi-Fi Research 12 Oct 2007. [http://www.powerwatch.org.uk/pdfs/20080425\\_wifi\\_memorandum.pdf](http://www.powerwatch.org.uk/pdfs/20080425_wifi_memorandum.pdf).
- h. Findlay & Dimbylow. SAR in a Child Voxel Phantom from Exposure to Wireless Computer Networks (Wi-Fi), *Phy Med Biol* 55 2010.
- i. Maganioti *et al.* Wi-Fi Electromagnetic Fields Exert Gender Related Alternation on EEG. 6<sup>th</sup> International Workshop on Biological Effect from Electromagnetic Fields.

2010.

- j. Papageorgiou *et al.* Effects of Wi-Fi Signals on the P300 Component of Event-Related Potential During an Auditory Hayling Task. *J Intergrative Neuroscience*, 10(2) 2011, 189-202.
31. I reserve the reserve the right to amend, to add new relevant studies as they may arise and pending analysis, additional testing, and recently received voluminous discovery.
32. I have not testified at trial or by deposition during the previous 4 years.
33. I will receive no compensation for my testimony beyond out-of-pocket expenses.
34. Submitted herewith is a PowerPoint presentation that I will present at trial along with my report from the inspection and resultant data.
35. Based on reliable foundations of science, it is generally accepted within the relevant scientific community and has been established that many bioeffects and adverse human health effects occur at far lower levels of RF/MW exposure than those that cause measurable heating. Children absorb at much as twice the microwave radiation as adults and children's risk from exposure to a carcinogen and neurotoxin, which RF/MW is, with children's risk increasing as age decreases. By contrast, educating by way of the Internet via cabled systems results in no exposure, as the cables insulate and protect the WI-FI signal and do not irradiate any humans.
36. Portland Public Schools' use of WI-FI is causing and will continue to cause other students, school staff and faculty adverse health effects and must be discontinued immediately.

Dated this 22<sup>nd</sup> day of December, 2011.

*/s/ Lloyd Morgan*

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L. LLOYD MORGAN