Introduction:

Electromagnetic fields (EMF) are emitted by anything that has electricity flowing within it, for instance, power lines, and electrical appliances. EMF is comprised of electric fields, which come from electric charges, and magnetic fields, which come from the motion of electric charges. This study focuses mainly on magnetic fields as it is produced by any electric device that is turned on (WHO, 2007). Magnetic fields can come from heaters (electrical equipment), fluorescent lights, motorized clocks, and video displays, to name a few (Trifield, nd). Around SFU there are many computers, pop machines, and other devices that could potentially be emitting harmful magnetic fields to the students and faculty. It is the intent of this study to establish if there are any areas in particular that are emitting large amounts of EMF and concurrently should be avoided by the general public. The image below shows all locations EMF readings were taken around SFU campus.

As society becomes more and more dependent of electronic devices, more controversy surrounds EMF that is produced by such devices. Extremely low frequency EMF emitted by these devices has been studied in recent years to determine whether there are harmful effects associated with it. If the EMF is high enough they have the potential to cause nerve and muscle stimulation as well as other harmful effects on the human body; however, the level of EMF required for such effects are widely debated. In a study conducted by the National Institute of Environmental Health Science it was concluded that extremely low frequency EMF could possible be carcinogenic although due to limited evidence no concrete decision could really be made. The classification of “possibly carcinogenic” was based on studies conducted on residential and occupation exposure to EMF causing leukemia and chronic lymphocytic leukemia, respectively. However, there was strong evidence that bone repair could be affected by exposure to EMF (NIEHS, 1998).

Due to indistinct results on harmful effects, more studies should be conducted on extremely low frequency EMF affects on health (NIEHS, 1998). The generally accepted safe level for magnetic fields is three milligauss and the average everyday strength is between one and three milligauss (Trifield, nd).

Data and Methods:

EMF data was collected throughout SFU campus using a Trifield Broadband Meter, the extended sensitivity version. The meter was set on the magnetic field setting for 0 -3 milligauss unless the reading was higher, in which case the 1 – 100 milligauss range was used. Points were randomly taken based on where student and faculty are located around campus both inside buildings and outside. Latitude and longitude, in decimal degrees, was also taken at each point location using GARMIN GPSmap 76 in order to get a geographic position of each location EMF was taken. Geographic positions had an accuracy ranging from six meters to sixteen meters depending on proximity to buildings and amount of cloud cover on the days measurements were taken. For locations indoors, a geographic position would be taken at the closest location outdoors since the GPS meter could not be used inside.

The SFU aerial photograph used to overlay EMF points in ArcMap was taken in 2004 by… This photograph is somewhat outdated due to the recent construction of UniverCity, Art and Social Science Complex and Blusson Hall, TASC buildings, and Cornerstone. Unfortunately, this was the most recent aerial photograph available.

The EMF data in excel spreadsheet format was imported into ArcMap using ‘Add x & y’ function. Latitude and longitude were used as x and y and the geographic reference used was ‘world 1984’ (find out what the real one is). Once the data was in ArcMap, the EMF layer was exported as its own layer file (find out what format it was in). ‘Editor’ function was used to move EMF point locations to actual locations of measurements as some of the GPS points were not directly where EMF reading was taken and due to limited accuracy in GPS measurements.

The SFU aerial photograph was imported into Idrisi and the EMF vector file (EMF vlx. file) was overlayed on top of it. Using symbol workshop a point symbol file was created to place EMF values into catagories. Catagories were determined by reviewing research and information presently known about EMF.

Results:

A map of EMF around SFU was created and EMF levels were placed into catagories. Green denotes that no magnetic radiation found, yellow denotes that EMF was found but it remains in the safe level for daily exposure (three milligauss), orange denotes that EMF was found but it was only slightly higher than the safe level, and red denotes that EMF was found to be high (greater than ten milligauss).

(put map here)

No overall patterns were found for EMF levels; measurements were very random across SFU campus. The areas of high exposure include point 112, located within the townhouse residence complex, point 41, located in the girls bathroom in the Academic Quadrangle near C9001, and point 42, located in the Academic Quadrangle next to B9200. Point 112 was in the vicinity of an electrical room and a pay telephone, which may explain its high value. Point 41 was located in a bathroom where electric hand driers are present; however, the meter was a fair distance from the heaters and since EMF decreases with distance from the source this may not be the source of the EMF (reference, ??). Finally, point 42 did not seem to be in the vicinity of anything significant that may produce EMF so the source of this magnetic radiation is unknown. The other areas that were above the recommended safe level include point 12, located next to a pay telephone, point 121, located near the passenger drop off area in the front of SFU, and point 102, located in the east side of West Mall Complex.

Errors:

When collecting data by hand it is very easy to introduce error into the data through simple human errors as well as through inaccuracy of EMF meter or GPS remote. Some of human errors could have been made by accidentally writing the wrong number down when collecting data, or since the meter measured by means of a needle and not digitally, errors could have been introduced when reading the meter. The needle also sometimes fluctuated when measurements were taken and number the needle was at most often was recorded. When taking geographic positions with the GPS remote accuracies ranged from six to sixteen meters depending on proximity to buildings and amount of cloud cover on the days measurements were taken. This could give inaccurate positions; however this was accounted for once the data was placed into the computer and geocoded onto the SFU aerial photograph. Errors also could have been introduced due to the fact that the GPS remote cannot be used indoors where many of the points were taken. Estimations of were the location was located from outside would have inputted a large amount of error into the data as well.

Furthermore, if there was more time to collect the data it I would have like to collect measurements on every level of the Academic Quadrangle and other various buildings around campus to see if the various floor had similar patterns. Instead, only one floor of each building was focused on; primarily the main entrance floor. Finally, data was taken based on where students and faculty were located around campus. There may have been high EMF areas that were missed throughout campus due to few people actually going to those places. However, I did not want to decide my points based only on known EMF emitters, I felt this would skew the data and give inaccurate results to how much risk there really is to being exposed to harmful magnetic radiation.

References: