TERRAPEX Environmental Ltd.

METHANE ASSESSMENT AND MONITORING

PROPOSED OAK RIDGES ELEMENTARY SCHOOL SITE
OLD COLONY ROAD, RICHMOND HILL, ONTARIO

JUNE 2008

BACKGROUND

The proposed Oak Ridges Elementary School site comprises approximately 2 hectares on the south side of Old Colony Road in Richmond Hill, east of Yonge Street and north of Stouffville Road. The site and surrounding area was reportedly used for agricultural purposes from prior to 1954 to at least 1997. By 2005, surrounding areas were under development for residential use.

In 2006, in preparation for construction of the school, the York Region District School Board retained McClymont & Rak Engineers Inc. (MCR) to complete a geotechnical investigation of the site. The results of field testing conducted as part of this investigation indicated the possible presence of methane gas in the ground. Subsequent field testing and laboratory analyses confirmed the presence of methane gas, but the results were not sufficient to define the extent and severity of the methane, or the potential impact of the methane on the proposed school development.

There were sufficient indications of the presence of methane to warrant a more focused and longer-term methane monitoring program. In an abundance of caution, the Board retained Terrapex Environmental Ltd. in November 2007 to undertake an eight-month comprehensive subsurface assessment and monitoring program for the presence of methane at the site.

METHANE CHARACTERISTICS

Methane is a colourless, odourless, non-toxic gas which is lighter than air and, in certain concentrations, is flammable. It is a natural by-product of the decomposition of organic material by bacteria, in the absence of oxygen. As a result, methane production may occur wherever there is decaying organic matter, for example in landfills, swamps, and even in organic-rich soil.

Because methane is lighter than air, in the natural environment it typically migrates upward and disperses into the atmosphere. However, in enclosed spaces with little or no air exchange, methane may accumulate. When the concentration of methane reaches approximately 50,000 parts per million (ppm) in air, it forms a potentially explosive mixture. This concentration of 50,000 ppm is referred to as the lower explosive limit (LEL).

Because methane is non-toxic, the primary risk associated with it is that of explosion, should it accumulate to concentrations above the LEL. Therefore, measured concentrations of methane are commonly reported as a percentage of the lower explosive limit (% LEL). For example, 100% LEL is approximately equal to 50,000 ppm of methane, and 1% LEL is approximately equal to 500 ppm.

Methane cannot cause an explosion unless it accumulates to a concentration above 100% LEL in an enclosed space where there is a source of ignition (spark, flame, etc.). In order for these conditions to occur, there must be a source of methane generation at a concentration above 100% LEL, and the methane must enter the enclosed space at a sufficient rate to accumulate to 100% LEL after dilution by ventilation in the enclosed space.

The Ontario Ministry of the Environment (MOE) has not published specific allowable concentrations of methane. However, the MOE *Guideline for Assessing Methane Hazards from Landfill Sites* (November 1987) recommends against development of any structure (on a landfill) if methane concentrations exceed 10% LEL, unless long-term gas control measures are in place. Accordingly, 10% LEL is often used as a benchmark against which methane concentrations are compared.

METHANE ASSESSMENT & MONITORING

Terrapex's methane investigation included installing seven gas monitoring probes at the site: four in the footprint of the proposed school building and three near the two probes installed by others where methane was previously detected. No apparent source of methane generation (i.e. soil containing evidence of high organic content) was observed by Terrapex during installation of the probes, nor reported by the other consultants that have undertaken investigations at the site.

Terrapex measured the concentrations of methane in the gas probes at the site 15 times from December 2007 through June 2008. For the most part, methane concentrations measured in the probes did not exceed 4% LEL. Methane in the ground at these levels is not uncommon at former agricultural properties, and does not represent a concern.

At one gas probe, located in the northeast corner of the proposed school building footprint, methane was measured at concentrations greater than the lower explosive limit during December 2007. However, the measured methane concentrations decreased in January 2008, and have been consistently less than or equal to 4% LEL since February 2008. This pattern of initially elevated methane concentrations followed by consistently low concentrations observed by Terrapex was also observed by the previous consultants at the site, and is consistent with methane generation in the subsurface at a low rate over a long period of time.

It is likely that where elevated methane concentrations were observed, the probes intersected "pockets" of accumulated methane which were subsequently vented by monitoring and not replaced, because of the low rate of methane generation. The "pockets" might consist of soil layers which permit the flow of gas better than surrounding soil, through pore spaces, fractures, or plant roots.

RECOMMENDATIONS

The results of the methane assessment and monitoring do not indicate a long-term risk to development of a school on the site. However, the potential for methane generation at the site has been proven and conditions across the site may vary. Therefore, Terrapex recommends as a proactive precaution that infrastructure for a passive venting system be installed beneath the school's concrete floor slab, in conjunction with the school construction.

The venting system should be connected to monitoring ports outside the building foundation walls, to allow monitoring for methane accumulation beneath the floor slab. This system should be monitored for a period of one year following installation, much of which will be conducted during construction, prior to occupancy.

Under normal operating conditions, the school will be maintained under positive air pressure, with a significant air exchange rate. Therefore, even if methane is detected in the venting system beneath the floor slab, it is unlikely to migrate into and accumulate within the school. However, if methane accumulation is detected beneath the floor slab, the recommended venting system can be easily converted to either passive or active venting to ensure that methane does not enter the school.