Management of Former Sabiston Landfill Site

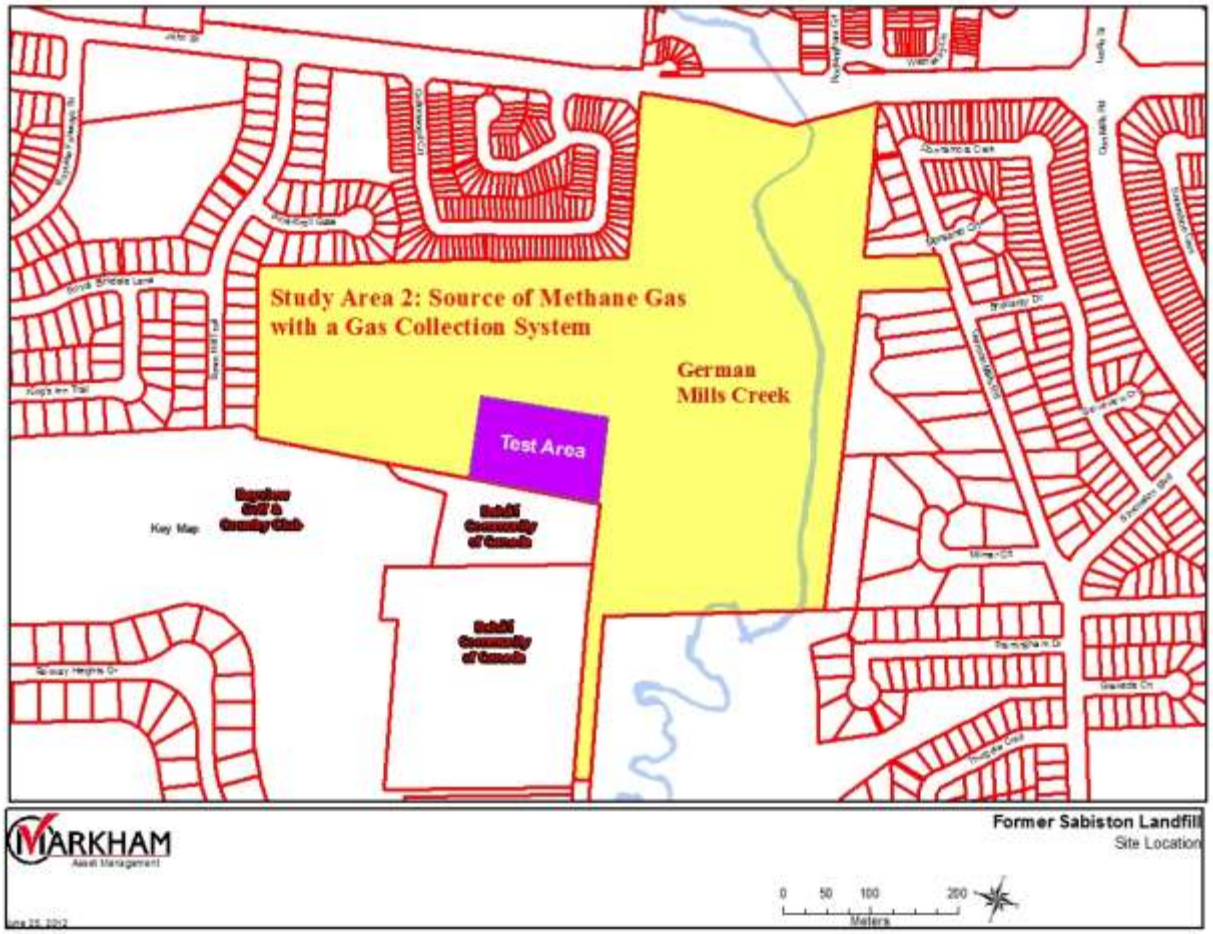
Presentation to Markham Council

June 26, 2012

Agenda

- Background: Former Sabiston Landfill Site
- Current management procedures
- Ministry of the Environment concerns &issues
- Rationale for Aerobic Technology
- Future Council processes

Background: Former Sabiston Landfill Site



1940 – 1960
Aggregate extraction pit

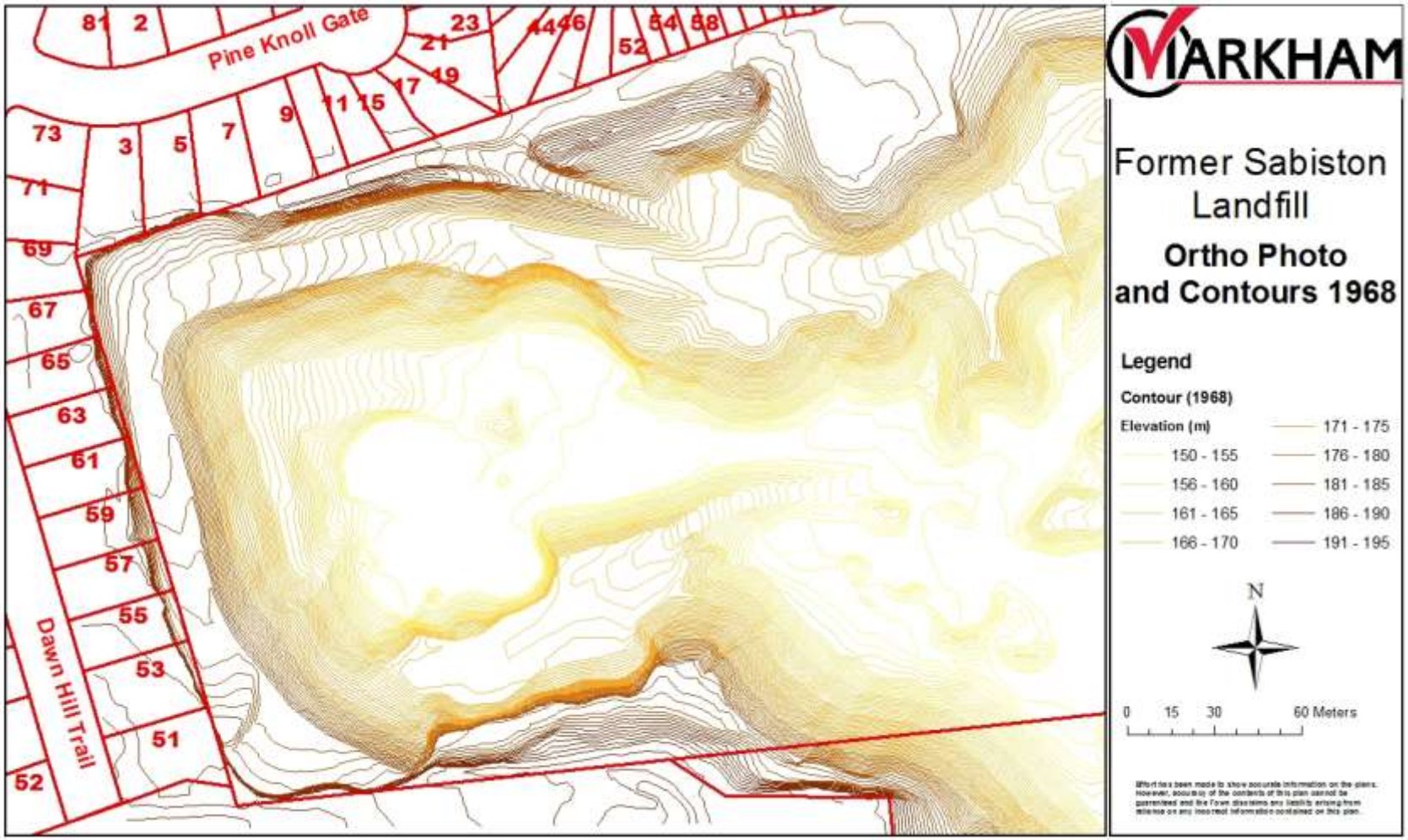
1960 - 1975
Landfill operation

1975:
Landfill closed

1983
Town takes ownership

Official Plan:Study Area 2 Landfill Area producing methane gas with a gas collection system

Contours 1968 Over-layed on Property Lines



Former Sabiston Landfill - Facts

- Unregulated – no controls on what was deposited
- Total composition of waste unknown, some information available from cores
- Stability unknown
- No liner
- 1 metre clay / till cap
- Evidence of continuous methane production
- Ongoing risk to Markham, residents and trail users
- Impedes healthy ecosystem
- Continuous leachate generation

By Products of a Closed Landfill

Methane Gas

- Odourless
- Colourless
- Lighter than air
- Flammable - explosive at concentrations of 5% to 15% by volume
- Asphyxiate at high levels

Leachate

- Ground water containing landfill contaminants
- Migrates along ground water paths

Former Sabiston Landfill - Management

- **Objectives:**
  - **Maintain the safety of residents and properties**
    - **prevent migration of methane to private properties**
    - **prevent explosions**
  - **Protect the environment**
    - **ensure leachate does not effect ground water or German Mills Creek**
    - **study feasibility of leachate collection system**
    - **protect ecosystem**

- **Continue management of the site following MOE regulations until no evidence of methane production nor waste decomposition is observed**

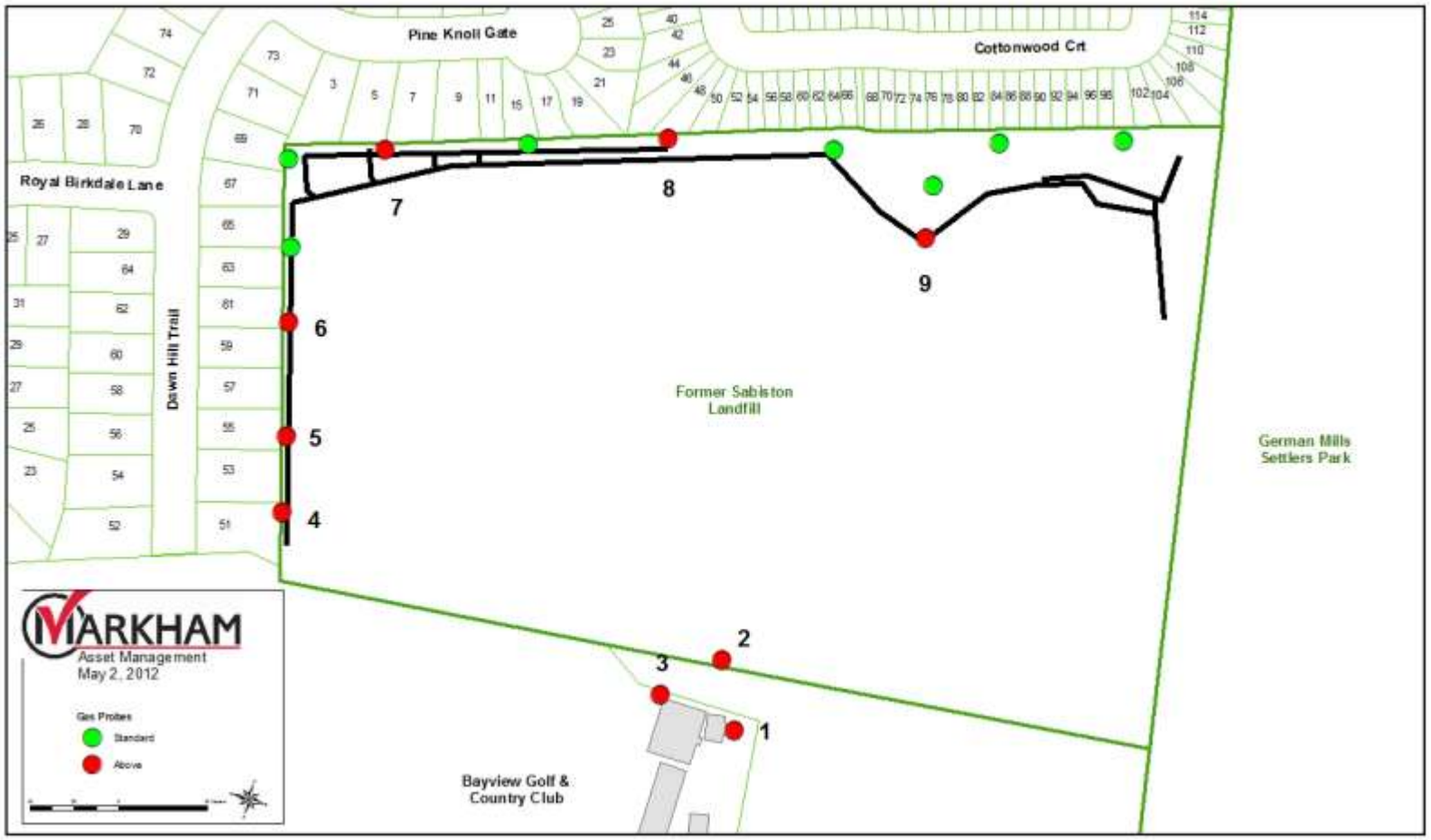
Former Sabiston Landfill – Mandated Procedures

- **Gas collection system**
  - Along boundary next to homes bordering on property
  - Series of wells and pipes connected to a suction pump draws the methane and exhausts it at the blower building
  - Acts as a barrier preventing the migration of methane onto private properties
  - Continuous 24 hour, seven day a week operation

Former Sabiston Landfill - Mandated Procedures (cont'd)

- **Gas probes (21)**
  - measure methane levels at the boundary to ensure gas collection system is working and methane is not migrating to private properties
  - gas probe concentrations are expected to be zero where the gas collection system is between the probes and the waste
  - readings taken once every two months according to the Ministry of the Environment regulations
  - more frequent monitoring when readings are above the MOE Compliance Level (2.5%) until the source of the problem has been identified and rectified and concentrations are back below 2.5%

Gas Monitoring Probe Locations: Bi-monthly monitoring



HISTORY OF HIGH METHANE READINGS

- **MOE Compliance Level: 2.5% by Volume**
- **Lower Explosive Level: 5% by Volume**

Feb – Mar 2010 : 7% - 18%
Action taken : More frequent readings until normal

Sep 2010 – present : 3% - 41%
Action taken : Indoor monitoring at Golf Course Buildings

Dec 2010, the MOE directed the Town to prepare an indoor monitoring program to ensure that no methane is migrating to private residences

July – Aug 2011 : 4% – 14%
Action taken : Repair exhaust pipe

HISTORY OF HIGH METHANE READINGS (cont'd)

- **MOE Compliance Level: 2.5% by Volume**
- **Lower Explosive Level: 5% by Volume**

Dec 2005 – Jan 2006 : 6%
Action taken: More frequent readings

June 2007 : 4% - 8%
Action taken: Repair pipes

Nov 2007 : 5%
Action taken: More frequent readings

Nov 2008 – Jan 2009 : 5%
Action taken: More frequent readings

Environmental Monitoring System: Bi-annual monitoring of Water Quality (*Groundwater & German Mills Creek)*

- **In 2011 additional testing wells were installed to better understand the leachate production and groundwater flow.**
- **Town has concern with leachate generation and the threat to the creek**
- **Feasibility study on a leachate collection system under way.**

Rationale for Consideration of Aerobic Technology

- Concerns about continuous methane gas production
  - Aerobic technology will eliminate methane gas production
- MOE directive to install indoor monitoring based on concern of potential risk to the homes and the lack of a buffer area between the landfill and the private properties
- Prompted staff to explore other options to manage the landfill site so as to:
  - protect the health and safety of the residents
  - reduce risk and the adverse effects of the decomposing waste
  - protect the environment
  - improve the health of the site's ecosystem
- Shortens decomposition by decades
- Recirculation will clean the leachate protecting the health of the creek

Reasons for the Pilot Test Site

- Understand waste composition
- Understand landfill gas forming potential
- Determine oxygen and moisture requirements for maximum efficiency of technology and temperature control
- Demonstrate what a full site implementation will look like and dispel concerns for residents
- Develop a business case (economical and environmental) for the whole site
- Improve knowledge of the site which will enhance the management capabilities to control methane and leachate
- Will continue to manage the landfill with the current system

Aerobic Technology

- Injection of air and water into waste to create aerobic reaction
- Increase the rate of decomposition and eliminate methane production
- Accepted practice in United States and in Europe
- Legislated as a best practice in parts of Europe
- Reduces risk from methane production
- Cleans leachate through recirculation
- Improves health of ecosystem

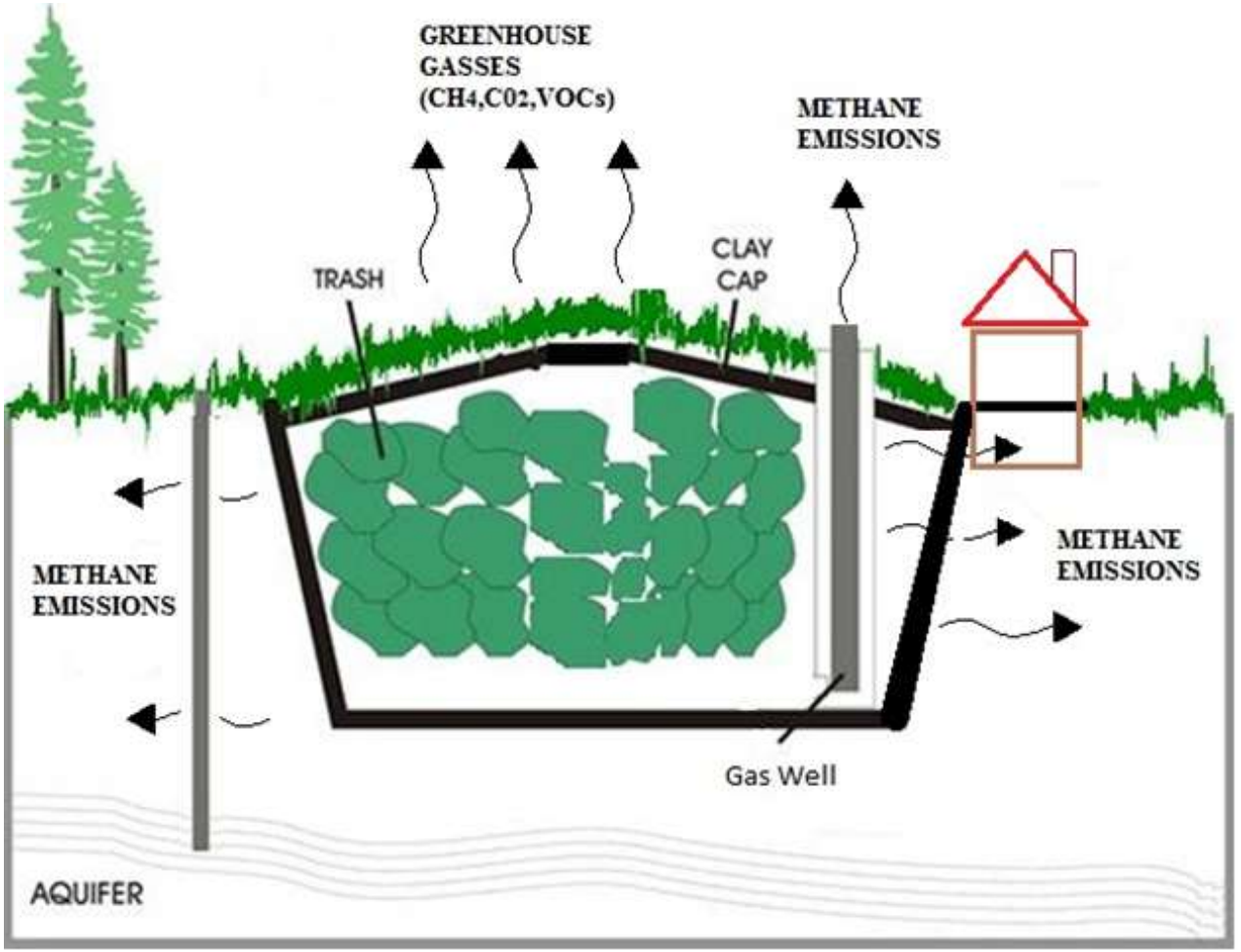
Aerobic Technology (continued)

- **Heat will be generated**
  - **heat will be controlled and contained within the landfill**
  - **heat will not be transferred to the surface – I metre clay / till cap acts as insulation**
  - **heat will not transfer across dry soil and will not move horizontally towards private properties**
- **Rapid settlement is expected to occur but overall settlement will remain the same. Town will continue to monitor and develop an active land management program.**
- **The natural environment will be protected. Specialists will be consulted and retained during construction to ensure effect on flora and fauna is minimized.**

Protection of Natural Environment

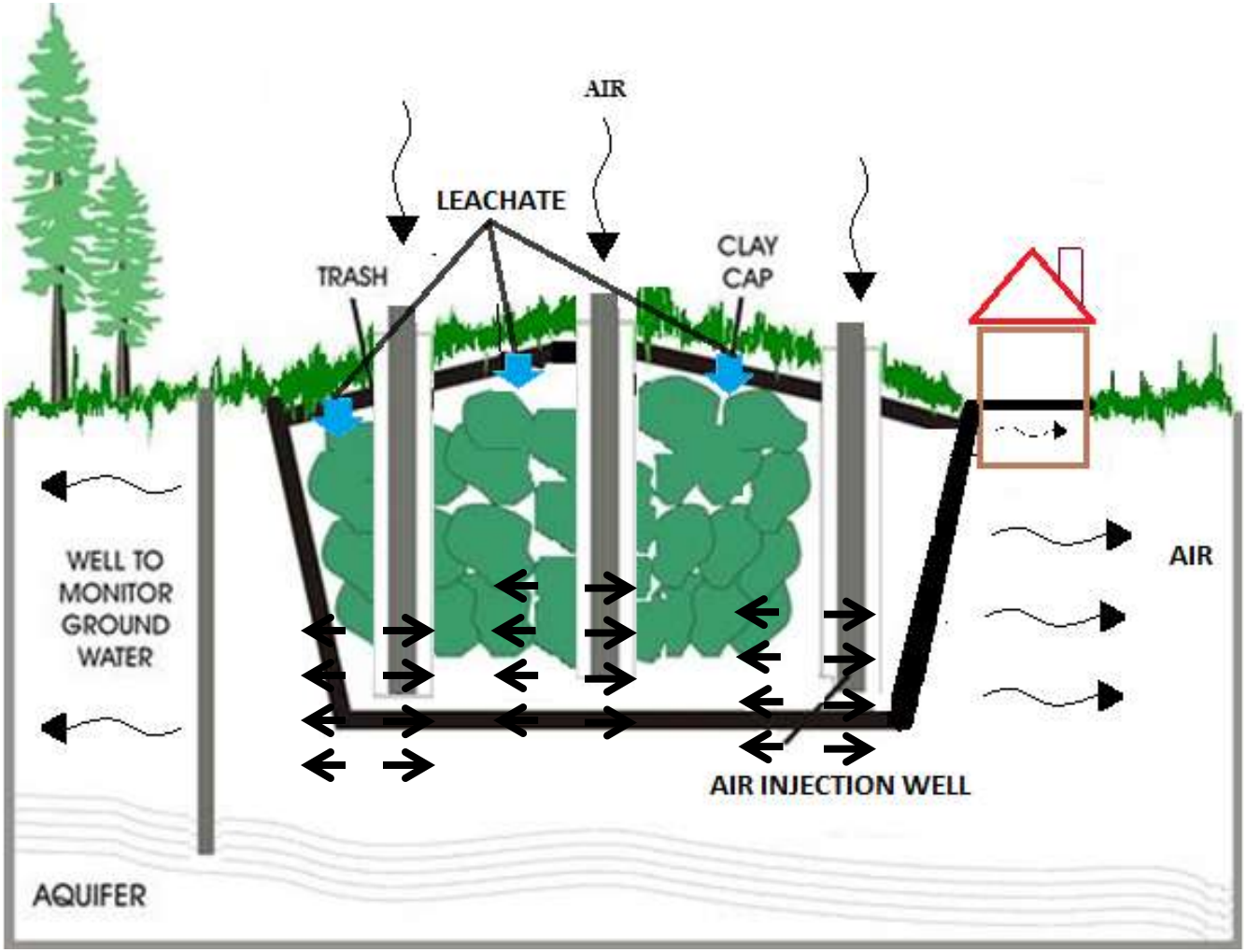
- **Biologist and Ecologist will be part of the team involved with the pilot project and will be engaged to provide advice on implementation and recommendations.**
- **Landfill management practices will be monitored by the MOE and may be adjusted according to future methane levels.**
- **The ecosystem (methane and leachate generation) is not healthy and will not be fully healed until decomposition is complete and methane generation has ceased.**

Conventional Landfill (Anaerobic)



(Source: Modified from the Energy Information Administration, 2007, http://www.eia.doe.gov/energyfacts/saving/recycling/solidwaste/landfiller.html)

Aerobic Landfill (ABL)



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Pilot Test Site

Air - Injection:

- Six to eight well nests 20-30 meters apart
- One 28 cum/min Fan (current Blower Fan - 56 cum/min)

Moisture Requirements:

- 10 well points, 20-50 meters apart
- 150 bathtubs per day, up to 50% - 70% recaptured
- 10 vacuum well pumps - 1000 – 1500 meters of pipe

Construction:

- 3 - 4 weeks similar to the 2010/2011
- Trucks: 2-3 vehicles for 3-4 weeks
- Drilling rigs: 1-2 rigs for 3 - 4 weeks

Summary

- **Safety, protection of residents and property and risk mitigation are first and prime considerations**
- **Protection of the environment and reduction of green house gases including methane and carbon dioxide**
- **Improve the capabilities of the land to grow vegetation**

Next Steps

- Additional Public Information Meeting to address all questions from March 19, 2012
- Report back to General Committee in fall 2012
- Continue to manage site with current systems and technology as per MOE regulations and the current Certificate of Approval for Air
- Install indoor monitors at 4 residential homes
- Reduce noise level at the blower house
- Study feasibility of leachate collection system

Facts About the Former Sabiston Landfill Area and the Recommended Aerobic Testing

1. **Why test for methane now when the former landfill site has been closed for 37 years? Hasn't most of the methane been released by now?**

   - *Methane is still being produced and will continue to be produced for decades. High levels of methane have been consistently detected on the southern boundary of the site where there is no methane gas collection system.*
   - *The current methane level readings at this location are a concern to Markham and to the Ministry of the Environment. The intent of this pilot project is to test a known technique for eliminating methane production from the Sabiston Landfill Site.*
     - *An independent consultant retained by Markham will estimate total amount of methane currently produced and to be produced in future.*

2. **Is there a safety concern over the existing methane capturing/disbursing process?**

   - *Markham actively monitors methane readings. While there have been some zero readings, there have also been instances high methane readings at the north and south boundary gas probes due to either the breakdown of the gas collection system and/or frozen ground. In 2011, the Ministry of the Environment (MOE) instructed Markham to install indoor monitoring in at least four homes for a period of one year to ensure the methane gas collection system is working and preventing methane migration. MOE has concerns related to methane migration to the homes. There will always be a safety concern for Markham in relation to the methane that is produced in the landfill. Until there is no methane our concerns for safety will remain.*

3. **Will the proposed aerobic process damage backyards, produce low areas of standing water, or create a breeding ground for mosquitoes?**

   - *The pilot test site will not affect residential backyards, or air and water quality. The proposed pilot study site will be implemented over an area of 150 meters X 100 meters and away from the residential homes. Accelerated decomposition will not impact area homeowners or their properties. Areas of extreme settlement within and around the pilot test area will be filled with clean fill or drainage channels will be added. There will be no water pooling. This is a closed, carefully controlled process.*

4. **Will the proposed aerobic process result in temperature changes, or affect wildlife or park users?**

   - T*he heat will be monitored and controlled by adjusting the air and moisture injection rates while insulation from the clay, till and fill cap will contain and disperse the heat. Constant monitoring will ensure this is a safe and stable process.*

5. **As the process requires drilling to inject air and water into the landfill, will there be any disruptions or hazardous waste brought to the surface?**

   - *The waste from the drilling will be captured and disposed of off-site at a designated facility. During the initial drilling phase, some odour and gases will be present similar to those currently being exhausted by the existing blower house. Once the wells are completed, they will be sealed at the surface to prevent the further release of odour and gases.*

6. **Will the process cause hazardous material to leach into German Mills Creek or the Don River system?**

   - *This process will significantly reduce the risk of leachate compared to the current state of the landfill. The aerobic process will take water from nearby shallow wells created for this purpose. This will protect the creek and collect existing landfill leachate, and prevent the leachate from entering German Mills Creek.*
   - *Many of the toxic chemicals dissolved in the leachate will react with the waste forming a precipitate, which is either inert or less toxic than the original dissolved substances. This process removes toxic materials from the leachate, making it less toxic, and less concentrated.*

7. **What is the chemical reaction / process that occurs for an aerobic landfill?**

   - *In an aerobic environment, respiring micro-organisms convert biodegradable waste to mostly carbon dioxide and water with stabilized humus remaining. Other by-products of anaerobic decomposition are odorous hydrogen sulphide and ammonia, which are diminished in aerobic landfills.*

8. **How disruptive will the construction process be, and how long will it take?**

   - *The initial construction will take about three to four weeks. It will require a single drilling rig, a single excavator, and one to two dump trucks. This is similar to the work carried out last summer near the golf club boundary. Ongoing monitoring will be conducted.*

9. Does Markham want to sell off this land for other users?

- *Markham has no intention of selling this land. This area is a vital and unique part of German Mills. We are undertaking this project for resident safety and environmental protection.*

10. How much water will be taken from German Mills Creek for moisture injection?

- *No water will be taken from German Mills Creek. The water will come from shallow wells (created for this purpose) at the base of the landfill. This will protect the creek and collect landfill leachate (ground water originating at the landfill containing contaminants).*
- *Initially, 20 litres/minute (28,800 litres/day) will be pumped from the wells. This is less than the MOE standard of 50,000 litres per day, which requires a water taking permit. It should be noted that that approximately 50% -70% of the injected water will be captured and re-circulated for injection.*

11. What would be the affect of heating plastics within the waste if the aerobic landfill was put in?

- *From investigations in case study landfills in Georgia, and excavations of waste material of a landfill site following aerobic decomposition, it was found that the working temperature had negligible effects on plastics as they remained intact in the stabilized landfill.*

12. At what point will Markham and residents know the aerobic system is working?

- *The test site will be monitored continuously. Over time, if there is a significant decrease in the methane (CH4) levels in the waste, we will know the system is working.*

13. What will be the ongoing maintenance, monitoring and inspection requirements for the aerobic system? How many hours per week will be required or will there be some SCADA system possible?

- *An automated data acquisition (SCADA) system will be used onsite, to reduce onsite personnel time to a few hours (5-10 hours max.) per week.*
- *The onsite visits will be for periodic calibration & inspection of equipment used for the project.*