GROUNDWATER MONITORING WELL SAMPLING AND MONITORING PROTOCOL

1.0 WATER LEVEL MEASUREMENTS

1. Prior to purging/sampling, water levels shall be measured with an electric depth gauge to the nearest 0.01 metres (or 0.01 feet).

2. Measurements shall be taken without the removal of the any dedicated sampling device (tubing and foot-valve arrangements).

3. Measurements shall be taken from top of the monitored well. In most cases, the measurement will be taken from top of the PVC casing and not the top of the protective casing.

4. Measurements shall be recorded in the field book for each specific monitor indicating measuring point.

5. Rinse tip of measuring device with distilled water after taking measurement in each monitor.

2.0 PURGING PROCEDURE

1. Prior to sampling, each well shall be purged to remove stagnant water within the casing.

2. Three casing volumes shall be removed by the dedicated samplers or by bailer from the wells with moderate inflow. The purged water shall be measured into a calibrated container and the volume shall be recorded in the field book for the specific monitor.

3. Field measurement of conductivity, dissolved oxygen, pH, temperature and redox potential will be measured at regular intervals during purging of groundwater monitoring wells and recorded in the field book. Leachate monitoring wells will be monitored for conductivity and pH regular intervals during purging of groundwater monitoring wells and recorded in the field book.

Equipment used to measure field parameters shall be calibrated according to manufacturers instructions. If the measured field parameters are not stabilized after removing three casing volumes, purging should continue until they are stabilized.

4. Slow inflow monitors shall be purged entirely dry. The volume of purged water shall be recorded in the field book for the specific monitor.

5. The volume of standing water in each monitor shall be calculated from the static level and the total well depth and recorded in the field book.

3.0 SAMPLING AND SUBMISSION PROCEDURES

1. Suitable sample bottles (containing pre-measured preservatives, as required) shall be obtained from the analyzing laboratory in advance of the sampling program. The number and type of field and spiked blanks shall be determined by prior consultation with the laboratory representative.

2. Samples shall be collected by means of the dedicated samplers in all monitor wells, if present. For slow inflow monitors, samples shall be collected the day following the purging exercise (to permit water-level recovery, if required).

3. Field filtering is required to collect a sample for dissolved metals only. Attach a 0.45 micron disposable filter to the end of the Waterra tube and allow the groundwater to filter through it before collecting the sample.

4. Sample collection shall be undertaken in the following sequence, as necessary:

i. Volatile organics
ii. Pesticides/herbicides
iii. Phenolics
iv. Heavy Metals
v. General Chemistry

5. Samples collected for volatile organics shall completely fill the sample bottle, <u>without</u> any air space

6. Place sample into a cooler with pre-frozen ice packs and deliver to laboratory within 24 hours after completion of program.

7. Sampling information shall be recorded in the field book.

8. Each sample bottle shall be labeled to indicate the project name, well designation, time of sample collection, preservatives added and analyses to be performed.

9. If submitted to a lab other than the city laboratory, a chain of custody forms shall be completed and submitted together with the samples to the laboratory. A copy of the chain of custody shall be retained by the sample collector.

SURFACE WATER MONITORING AND SAMPLING PROTOCOL

1. Sampling shall be preferably undertaken under base flow condition (to observe maximum quality impact). Thus, there shall be several days without precipitation before the sampling survey.

2. Sampling shall be preferably undertaken when the stream has a discernable flow. Sampling of pondings shall be discouraged unless representative of the local conditions. If a sample is collected in a stagnant water body this should be noted in the field book.

3. Samples shall be collected at mid-depth in the stream (to prevent the uptake of bottom sediments) and preferably from the middle of the stream. Remove bottle cap when sampling point reached within the stream.

4. Samples shall be directly collected into the sample bottles (with or without preservatives, as required) WITHOUT filtering.

5. Field measurements shall be taken of the temperature, conductivity, pH and DO at each sampling station when samples are collected for chemical analysis. Flow will be estimated at each location. Some locations have a weir to determine flow. Flows are to be estimated at other locations by estimating the stream depth, width and the current velocity.

6. Pertinent information on the weather and stream conditions shall be recorded for each station during each site visit in the field book.

7. Any digitally-metered instrument used to obtain field measurements (other than temperature) shall be calibrated <u>before</u> and <u>after</u> the sampling survey to ensure reliable results.

PRIVATE WATER WELL SAMPLING AND MONITORING PROTOCOL

1.0 PURGING PROCEDURE

1. Prior to sampling, water will be run from a tap for at least 3 minutes.

2.0 SAMPLING AND SUBMISSION PROCEDURES

1. Suitable sample bottles (containing pre-measured preservatives, as required) shall be obtained from the analyzing laboratory in advance of the sampling program. The number and type of field and spiked blanks shall be determined by prior consultation with the laboratory representative.

2. Sample collection shall be undertaken in the following sequence, as necessary:

ii. Volatile organics
iii. Pesticides/herbicides
iv. Phenolics
v. Heavy Metals
vi. General Chemistry

3. Samples collected for volatile organics shall completely fill the sample bottle, <u>without</u> any air space

4. Place sample into a cooler with pre-frozen ice packs and deliver to laboratory within 24 hours after completion of program.

5. Sampling information shall be recorded in the field book.

6. Each sample bottle shall be labeled to indicate the project name, well designation, time of sample collection, preservatives added and analyses to be performed.

7. If submitted to a lab other than the city laboratory, a chain of custody forms shall be completed and submitted together with the samples to the laboratory. A copy of the chain of custody shall be retained by the sample collector.

LANDFILL GAS MONITORING PROTOCOL

1.0 CONTINUOUS MONITORING

1. Atmospheric concentrations of methane, oxygen, and hydrogen sulphide will be monitored on a continuous basis inside all permanent buildings on-site.

2.0 SOIL GAS MONITORING AND SAMPLING PROTOCOL

1. Monitoring shall be conducted using a personal sample draw gas instrument that is in good working order and calibrated to measure methane gas.

2. Connect the instrument to the well head and begin collecting sample. Continue measurement until the reading stabilizes. Methane readings may be recorded as a percentage of the total air by volume, a percentage of the Lower Explosive Limit (LEL), or in parts per million (ppm).

3. Monitoring shall be preferably undertaken at times when landfill gas is most likely to migrate (period of low barometric pressure, saturated soil, frozen or ice covered ground).

4. Measurements and other pertinent information, including weather conditions shall be recorded for each location during every site visit in the field book