



8.(b)

November 10, 2010

Reference: Commission Leachate and Landfill Gas Contingency Response

At the June 24, 2010 Annual Fundy Region Solid Waste Commission meeting CMEI requested clarification and specifics regarding contingency plans for leachate and landfill gas.

The original 1997 Environmental Management Plan (EMP) clearly outlines the remedial responsibilities of the Commission. A draft revision was submitted to the government in 2008 for feedback with a final copy to be completed with the commissioning of the gas and electrical system in 2011.

Domestic Wells under section 6.4.3 of the 1997 EMP clearly states that measures will be taken to insure property owners are supplied with an acceptable water supply if their well is contaminated from landfill leachate. Two alternatives are identified including alternative water supply and filtration. Other areas relating to leachate and ground water are found under section 6.0 of the EMP.

Landfill gas is currently monitored in the pumphouses on the landfill footprint and in some other surrounding buildings. Contingencies for evacuation are set. Landfill gas is found under section 6.1 Air Quality of the 1997 EMP. Final protocols will be completed with the new EMP revision for the landfill gas collection and utilization system. Remediation alternatives are outlined, but will also be revisited in the new EMP. An important consideration is that we are not producing any extra gas than what would have been produced without a gas system. We are collecting and destroying it thereby lessening gas accumulation.

The Fundy Region Solid Waste Commission also carries 'Environmental Insurance' to meet any costs associated with contamination of property. Any number of scenarios could be hypothetically defined and as such incidents would be treated on a case by case basis.

Marc MacLeod
General Manager

Attached: 1997 EMP Sections 6.0 – 6.5

6.0 THE ENVIRONMENTAL MONITORING PLAN

The Commission is committed to carrying out environmental monitoring as part of the overall environmental management plan. That is, monitoring will be conducted by measuring quantitatively and qualitatively components in both the ecosphere and socio-economic sphere before and during construction and operation of the landfill.

Environmental monitoring will be conducted as part of the Commission's overall commitment to environmental protection and as committed to in the EIA.

Monitoring will permit impact predictions in the EIA to be verified, it will also allow mitigative measures to be implemented, if necessary, in a timely fashion and will facilitate the minimization of environmental impacts. The monitoring program is designed to:

- provide for the collection of meaningful data that will allow mitigative measures to be implemented as required,
- fulfill all monitoring commitments made in the EIA,
- fulfill all monitoring required by the COA to Operate, and
- be flexible in scope and content such that the program can be easily adjusted to reflect real world conditions and ongoing monitoring.

The monitoring program described herein is to be carried out in conjunction with the routine inspection activities mandated in the Operations Manual.

As part of the program, air quality, groundwater, surface water, leachate, noise, waste, visual buffers, assessment and land values, collection vehicles, and traffic will be monitored during site operations. Groundwater and surface water monitoring will begin before construction and operational activities in order that meaningful baseline data is compiled. During the construction phase, groundwater and surface water, as well as dust, noise and traffic will be monitored.

The Environmental Coordinator, with assistance from the General Manager, as required, will have overall responsibility for ensuring the environmental monitoring

plan is implemented, the required sampling stations established and an Environmental Monitoring Log is maintained.

The Environmental Monitoring Log will be divided into various sections as outlined below, in which the various components of the monitoring program will be recorded. A log will be kept for each calendar year and will be summarized at year end by the Environmental Coordinator. A summary of the Monitoring Log will be included in the Annual Report and environmental incidents described within will be reported to the Commission by the General Manger as required.

Monitoring Log Components:

- Air Quality
- Leachate
- Groundwater - On-site
- Groundwater - Off-site
- Surface Water
- Indiscriminate Dumping
- Waste Inspection
- Aesthetics
- Noise
- Property Assessments
- Collection Vehicles
- Traffic

6.1 Air Quality

6.1.1 Monitoring Requirement

Non Methanogenic Compounds

Air quality monitoring will be conducted to confirm calculated emission rates from the landfill and off property concentrations for total suspended particulate (TSP). Specifically, air quality at the gas vent in the cell and at a receptor 100 metres outside the peripheral road near the landfill is to be monitored for the parameters, frequency and duration identified in Table 6-1. If air quality does

not meet the levels shown in Table 6-1, then mitigative measures and continued sampling will be undertaken.

Landfill Gases

Monitoring of methane concentrations in soil above the water table will be conducted annually. In addition, combustible gas concentration measurements will be taken at leachate sumps, and associated storage infrastructure. If concentrations are above 25% of the lower explosive limit, a more detailed monitoring will be undertaken and mitigative measures implemented.

Monitoring will begin once the site has been in operation for five years.

6.1.2 Monitoring Responsibility

The Environmental Coordinator is responsible for engaging qualified air quality monitoring personnel, maintaining monitoring data, compiling data for the annual report and reporting monitoring results to the Commission.

TABLE 6-1: AIR QUALITY MONITORING REQUIREMENTS
NON-METHANAGENIC COMPOUNDS

Location	Gas Vent in Cell	Station AQ - 1*
Parameter	carbon tetrachloride, chloroform, 1,2-dichloroethene, ethylene dibromide, ethylene dichloride, methylene chloride, perchloroethene, trichloroethene, vinyl chloride, 1,1,1-trichloroethane, vinylidene chloride, total non methane organic compounds	total suspended particulate
Initiation	after first gas vent is installed	November 1997
Frequency	quarterly	quarterly
Duration	two years minimum	two years minimum
Requirement	trace amounts observed	annual average < 70 ug/m ³ , 24 h max < 120 ug/m ³

*Station AQ -1 is located 100 metres away from the peripheral road near the landfill in the direction of the prevailing wind.

6.1.3 Remedial Measures

If TSP levels are higher than the regulated maximums the following remedial measures will be implemented during prolonged dry and windy periods:

- treating the unpaved roads with water, calcium chloride and/or chemical stabilizers
- flushing and/or sweeping of paved roadways,
- treating areas where heavy equipment is operating with water or other chemical stabilizers,
- spraying or wetting cover material prior to loading or unloading operations.

If methane concentrations are above acceptable limits, vents will be inspected and gas dissipated as required.

6.2 Leachate

6.2.1 Monitoring Requirements

Leachate collected from the waste disposal cell(s) shall be sampled *weekly* and analyzed for BOD, referred to as Package A on the monitoring schedule. In addition, leachate collected from the waste disposal cell(s) shall be sampled *monthly*, and analyzed for the parameters listed in Table 6-2 below, also referred to as Package B.

TABLE 6-2: LEACHATE ANALYSIS PARAMETERS - PACKAGE B

Ammonia	Iron	Nickel
Chloride	Chromium	Nitrite - Nitrate
COD	Copper	TKN
Conductivity (Field Parameter)	TOC	Total Phosphate
pH	Manganese	Zinc

6.2.2 Monitoring Responsibility

The Environmental Coordinator or his designate is responsible for engaging qualified sampling personnel, maintaining monitoring data, reporting monitoring results to the Commission on a monthly basis, and compiling data for the annual report. He is also responsible for forwarding monitoring data to NBDOE quarterly as outlined in the COA - Operate. The General Manager is also responsible for ensuring mitigative measures are undertaken as required.

6.2.3 Remedial Measures

Remedial measures will be determined when the leachate treatment system design is finalized.

6.3 Groundwater - Monitoring Wells

6.3.1 Monitoring Requirements

The locations of the groundwater monitoring sites are shown on Figure 6-1. Groundwater monitoring nests MW31, MW32, MW33, MW34, MW35, MW36, MW37, MW38, MW39, MW40, MW41, MW42, MW43, MW44, MW45, MW46, MW47, MW48, MW49 and MW50 will be sampled and analyzed for the parameters identified in Table 6-3, and identified on the monitoring schedule as Package C.

TABLE 6-3: GROUNDWATER MONITORING - PACKAGE C

Alkalinity	Conductivity (Field Parameter)	Selenium
Aluminum	Copper	Silver
Ammonia	Dissolved Oxygen (Field Parameter)	Sodium
Antimony	Hardness	Strontium
Arsenic	Iron	Sulfate
Barium	Lead	TDS
Beryllium	Lignin & Tannin	Temperature (Field Parameter)
Boron	Manganese	Thallium
BOD ₅	Magnesium	Tin
Cadmium	Mercury	TKN
Calcium	Molybdenum	Total Organic Carbon
Chloride	Nickel	TPH/BTEX
Chromium	Nitrate - Nitrite	TSS
Cobalt	pH	Uranium
COD	Potassium	Vanadium
Coliform (Total and Faecal)	Phosphate	Zinc

MONITORING SCHEDULE 1997-98 - FUNDY REGION WASTE MANAGEMENT FACILITY

REVISED: NOVEMBER 04, 1997

SAMPLE LOCATION	NO OF SAMPLES	NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NO. SAMPLES								
		3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10		17	24	31	7	14	21	28	5
MONITORING WELLS																																		
MW 31	3	CD																									9							
MW 32	2	CD																									6							
MW 33	2	CE	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	28							
MW 34	2	CDE	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	28							
MW 35	2	CE	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	28							
MW 36	3	C																									9							
MW 37	5	C																									15							
MW 38	3	CDE	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	42							
MW 39	5	C																									15							
MW 40	3	C																									9							
MW 41	3	CE	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	42							
MW 42	3	C																									9							
MW 43	2	CD																									6							
MW 44	2	C																									6							
MW 45	3	C																									9							
MW 46	2	C																									6							
MW 47	3	C																									9							
MW 48	3	C																									9							
MW 49	3	C																									9							
MW 50	3	C																									9							
UNDERDRAINAGE																																		
UD 1	1	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	12							
UD 2	1	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	12							
DOMESTIC WELLS																																		
DW all	65																										130							
SURFACE WATER																																		
SW 1	1	G																									4							
SW 2	1	G																									4							
SW 3	1	G																									4							
SW 4	1	G																									4							
SW 5	1	G																									4							
SW 6	1	G																									4							
SP 7	1	G																									4							
LEACHATE																																		
LC 1	1	AB	A	A	AB	A	A	A	A	AB	A	A	A	A	AB	A	A	A	AB	A	A	A	A	A	A	A	A	52						
LEGEND:																																		
E	after prolonged pumping	Package B -	Leachate general chemistry	Package C -	Comprehensive chemistry plus TPH	Package D -	Volatille organic compounds	Package E -	Groundwater general chemistry	Package F -	Domestic well general chemistry	Package G -	Surface water general chemistry																					
AB	after prolonged pumping	Package A -	BOD only																															

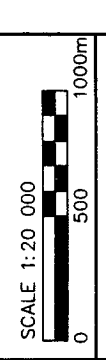
LEGEND:

E - after prolonged pumping
 Package A - BOD only
 Package B - Leachate general chemistry
 Package C - Comprehensive chemistry plus TPH
 Package D - Volatille organic compounds
 Package E - Groundwater general chemistry
 Package F - Domestic well general chemistry
 Package G - Surface water general chemistry

LEGEND:

- SW3 ▲ SURFACE WATER SAMPLE SITE
- DRAINAGE AREA
- ⊙ MONITORING WELL, 1993
- ⊕ MONITORING WELL PROPOSED, 1997
- DOMESTIC WELL SAMPLE SITE

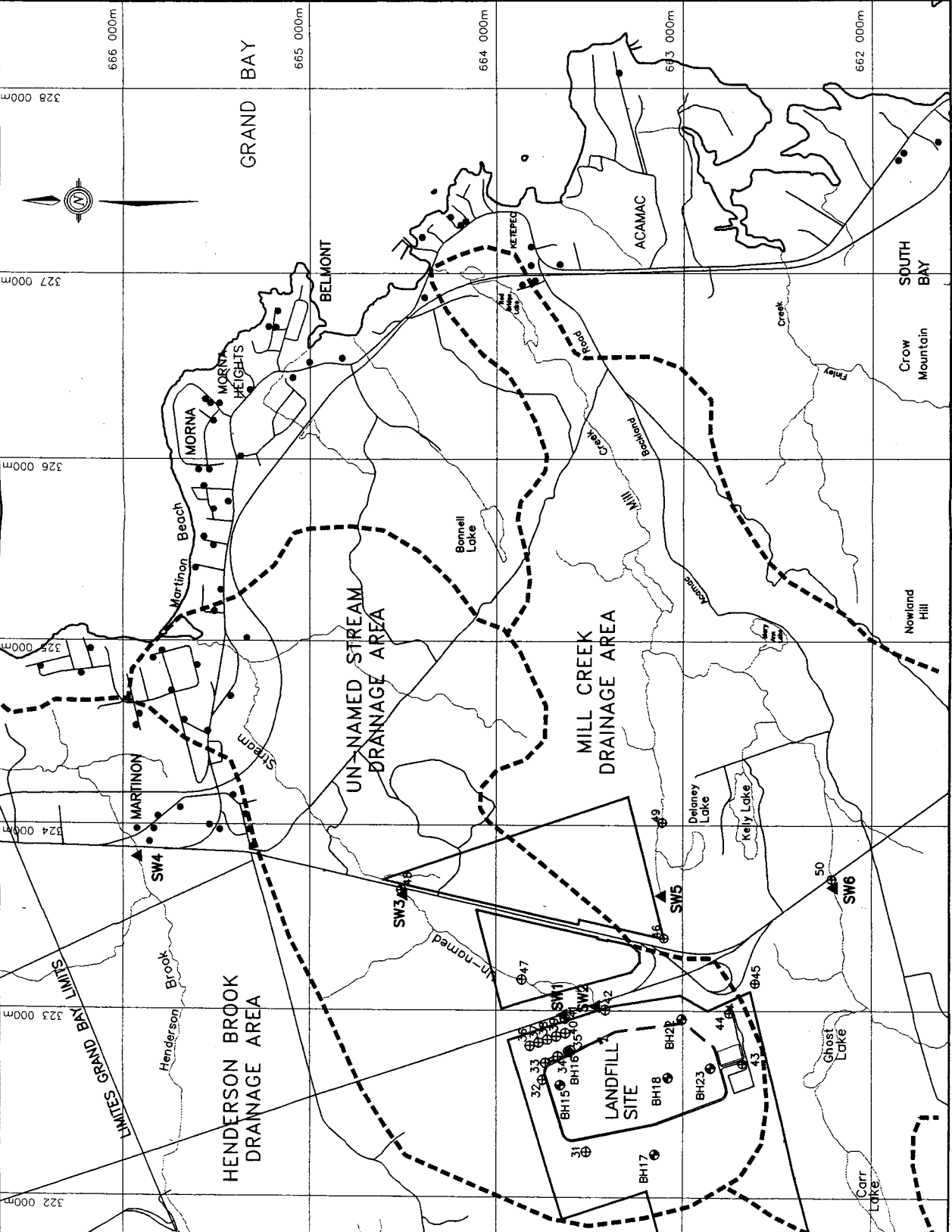
NOTE: REFER TO DWG 658.11-06-01 REV.2 (LOCATION OF PROPOSED MONITORING WELLS) FOR WELL DETAILS OF PROPOSED SITES



PROJECT
 ENVIRONMENTAL MANAGEMENT PLAN
 CRANE MOUNTAIN LANDFILL SITE

DRAWING
 SURFACE WATER AND GROUNDWATER MONITORING SITES

SCALE	1:20 000	DATE	OCTOBER, 1997
PROJ.No.	658.11	DWG.No.	FIGURE 6-1
DRN.BY	CGH	CHKD.BY	SP



Sampling will take place prior to acceptance of waste, then in the spring and summer of the following year, as per the monitoring schedule.

In addition to the parameters listed in Table 6-3, samples from monitoring nest MW31, MW32, MW34, MW38 and MW43 will be analyzed for EPA 624 Volatile Organic Compounds. Package C in addition to EPA 624 volatile organics is referred to as Package D on the monitoring schedule.

Groundwater samples from monitoring well nests MW33, MW34 MW35, MW38 and MW41 from the underdrains of both the cell and the sedimentation pond shall be sampled once per month as presented on the monitoring schedule and analyzed for the parameters identified in Table 6-4.

TABLE 6-4: GROUNDWATER MONITORING - PACKAGE E

Ammonia Chloride Dissolved Oxygen Conductivity	pH Nitrate - Nitrite Manganese	Iron TKN Total Organic Carbon
---	--------------------------------------	-------------------------------------

Every six months an additional set of samples will be obtained from these wells (MW33 - MW41) following prolonged pumping and analyzed for the parameters identified in Table 6-4.

Groundwater elevations shall be recorded for each sampling event and rainfall events shall be reported for the seven days prior to the sampling event.

6.3.2 Monitoring Responsibility

The Environmental Coordinator or his designate is responsible for engaging qualified groundwater sampling personnel, maintaining monitoring data, compiling data for the annual report and reporting monitoring results to the Commission on a monthly basis. He is also responsible for reporting the results to NBDOE quarterly. The General Manager is also responsible for ensuring mitigative measures are undertaken as required.

6.3.3 Remedial Measures

From an analysis of the background water chemistry data, "trigger" concentrations will be established for key parameters. If these trigger concentrations are exceeded, those wells will be sampled and tested on a more frequent basis in accordance with the intent of ASTM PS 64-96. Should it become clear that these exceedances reflect a true change in water quality attributed to landfill presence, not statistical or seasonal variability, remedial measures will be implemented.

One of more of the following remedial measures will be considered:

- plume delineation and source identification by the construction and sampling of additional more closely spaced monitoring wells
- containment and remediation of affected groundwater by pump and treat
- containment of affected groundwater by slurry cut-off or reaction walls in-situ groundwater remediation by biological and/or chemical means

6.4 Groundwater - Domestic Wells

6.4.1 Monitoring Requirements

Two comprehensive rounds of domestic well groundwater sampling have been completed prior to placing waste at the site. Future samples will be collected on a semi-annual basis, as specified in the monitoring schedule, and analyzed for the parameters in Table 6-5. The third round of sampling will take place in April, 1998.

Selected locations may be targeted for more comprehensive chemical analysis.

TABLE 6-5: DOMESTIC WELL SAMPLING - PACKAGE F

Ammonia Chloride Conductivity (Field Parameter) Iron	Manganese Nitrate - Nitrite pH (Field)	TKN Total Organic Carbon Coliform (Total and Faecal)
--	--	--

6.4.2 Monitoring Responsibility

The Environmental Coordinator or his designate is responsible for engaging qualified groundwater sampling personnel, maintaining monitoring data, reporting monitoring results to the Commission on a semi-annual basis and compiling data for the annual report. He is also responsible for reporting the monitoring results to NBDOE. The General Manager is also responsible for ensuring mitigative measures are undertaken as required.

6.4.3 Remedial Measures

From an analysis of the background water chemistry data, "trigger" concentrations will be established for key parameters. If these trigger concentrations are exceeded, those wells will be sampled and tested on a more frequent basis in accordance with the intent of ASTM PS 64-96. Should it become clear that these exceedances reflect a true change in water quality attributed to landfill presence, not statistical or seasonal variability, remedial measures will be implemented. The Department of Environment and Health will be advised. Supplementary measures by the property owner and/or the Commission may be required to address the situation.

Should water quality deteriorate and become non potable as a direct result of the landfill operation, then one or more of the following remedial measures will be implemented so as to ensure that property owners have an acceptable water supply:

- replacement of the domestic supply or supplies with an alternative supply
- provision of in-line treatment using filtering processes

6.5 Surface Water

6.5.1 Monitoring Requirement

Surface water monitoring will be conducted at three locations in the unnamed drainage basin, at one location in Henderson Brook and at two locations in Mill Creek, refer to Figure 6-1. Surface water samples will be collected quarterly as outlined on the monitoring schedule and analyzed for the parameters identified in Table 6-7.

TABLE 6-7: SURFACE WATER MONITORING - (PACKAGE G).

Ammonia Chloride Conductivity (Field Parameter Iron	Manganese Nitrite - Nitrate pH	TKN Total Organic Carbon TSS
--	--------------------------------------	------------------------------------

In addition, surface water that discharges from the sedimentation pond shall be sampled monthly and analyzed for the parameters in Table 6-7.

6.5.2 Monitoring Responsibility

The Environmental Coordinator or his designate is responsible for engaging qualified surface water sampling personnel, maintaining monitoring data, reporting monitoring results to the Commission on a quarterly basis and compiling data for the annual report and reporting monitoring results to the Commission on a quarterly basis. He is also responsible for reporting results to NBDOE. The General Manager is also responsible for ensuring mitigative measures are undertaken as required.

6.5.3 Remedial Measures

The discharge from the sedimentation pond shall have total suspended solids of less than 25 mg/L. If surface water contamination originating from the landfill is detected, one or more of the following remedial measures will be implemented:

- contamination source identification and restoration

- adjust discharge practices (from the sedimentation pond)
- containment and treatment
- dilution and natural attenuation