CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

Talia Landfill Gas and Electricity Production in Israel

Version 1 19/12/2005

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Title: Talia Landfill Gas Recovery Project and Electricity Production
Version of Document: 1
Date of the Document: September 2005

A.2. Description of the project activity:

Purpose of the project activity:

The project extracts landfill gas from an existing landfill and uses its methane content for energy production.

The view of the project participants of the contribution of the project activity to sustainable development:

The controlled extraction of landfill gas improves the practice of waste management in Israel, where no regulations for collection of landfill gas exist.
The landfill gas will be used for power production and therefore replace fossil fuels. Local air pollutants will be reduced due to the substitution of fossil-fuel based power generation. Furthermore the safety properties of the landfill will be improved, as the risk of explosions will be reduced. Moreover, odour will be reduced and surface water quality be improved.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Israel (Host)	Madei Taas Ltd ,Private entity	Yes
EU Country	To be confirmed	To be confirmed

Further contact information of project participants is found in Annex 1

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Israel

A.4.1.2. Region/State/Province etc.:

Emek Hayarden

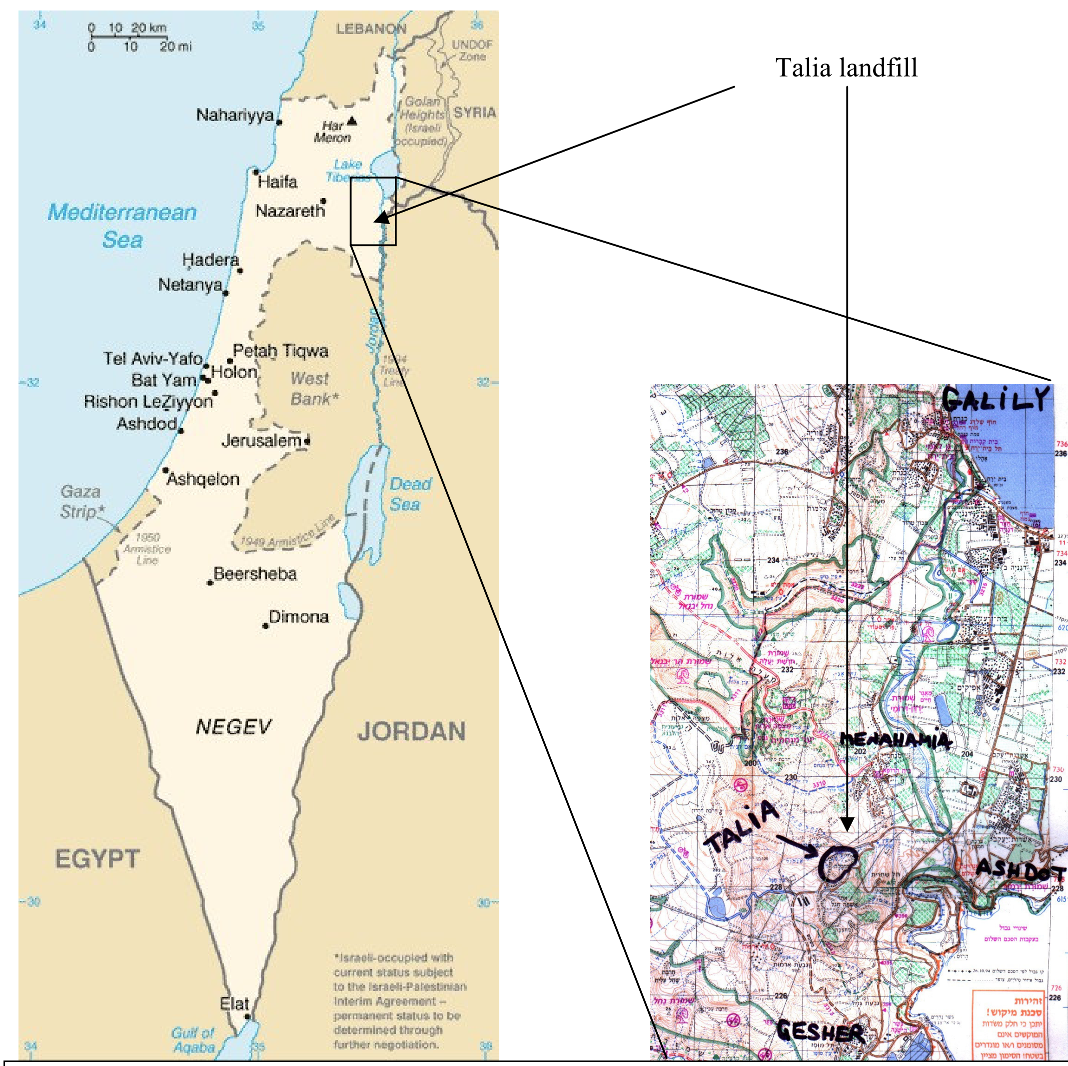
A.4.1.3. City/Town/Community etc:

Kibbuz Menahamia

A.4.1.4.Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project is located in the Jordan Valley near the agriculture community Menahamia (north of the city Beit Shean, south of the Sea of Galilee, east to highway 90). (32°39' eastern longitude and 35°33' northern latitude). Its location with respect to the surrounding villages is as follows:

Menachamia – 0.7 km north to site.
Ashdot Yaakov 1 – 2.6 km northeast to site.
Gesher – 2.6 km south to site.
Ashdot Yaakov 2 – 3 km north to site.
Afikim – 4 km northeast to site.
Beit Zera – 4.4 km northeast to site.
Dgania – 5.5 km northeast to site.



A.4.2. Category(ies) of project activity:

The project belongs to sectoral scope 13 "Waste handling and disposal". It consists of two components: recovery and combustion of landfill gas; renewable electricity generation

A.4.3. Technology to be employed by the project activity:

Several vertical gas wells will be drilled into the landfill body. This gas wells will be connected by an air tight tube system. A blower will create suction within the tube system and gas wells and therefore force the landfill gas into the system. At a central station, the gas is metered, taking into consideration percentage of methane, pressure and temperature. The main part of the gas will be delivered to engines with up to 1-3 MW capacity that will produce energy for the national grid. The remaining gas will be combusted within a high temperature flare.
Gas volume, temperature, pressure and methane concentration are constantly monitored. All data is stored directly in the monitoring devices as well as automatically written in a protocol every hour. The calculation of gas density and amount of methane is continuous using a computerised system that will also make the data real time available in the internet for verification purpose. Dangerous concentrations of O_2 or CO will cause automatic alarm and shutoff of the plant.

The mentioned technologies are known in Israel but rarely used in this connection. The high temperature flare, blower, gas analyser, industrial computer are all imported from Europe.
Existing systems for the collection and flaring of landfill gas in Israel use much simpler technology. The computerized monitoring system that is especially designed to be in line with the ACM0001 is an innovation to increase accuracy of the GHG reduction monitoring.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

Activities:
There are two complementary activities reducing greenhouse gases in the project:

a) Collection and controlled combustion of landfill gas, converting CH_4 emissions into CO_2 and therefore reducing its greenhouse effect
b) Using landfill gas as an alternative fuel that is virtually CO_2 neutral. The power is delivered to the national grid where it replaces power generated from fossil fuels

Baseline:
a) the continued practice of uncontrolled and unlimited release of landfill gas (CH_4) to the atmosphere. Without the proposed project the methane would be emitted to the atmosphere completely.
b) The usage of fossil fuel (according to the carbon intensity of the national grid) for power generation. Without the project activity the generation mix in the Israel grid would have less CO_2 neutral sources.

Description of Project Background:

The Talia landfill site was established in 1977 by the following 5 municipal authorities: city of Tiberias, the local authority of Beit-Shean valley, the local authority of Jordan valley, municipality of Migdal and Menahamia. The site was closed by 31.12.1999. Between 1977 and 1993 about 800,000 t of municipal solid waste were deposited at Talia landfill, from 1994 to 1999 2,200,000 t. After closure, the site was covered with a layer of dirt. There was no other remedial action taken. In Israel, there is no legal restriction to collect landfill gas and to flare it or use it in any other way.
The landfill is to be reopened and from 2009-2024 annually 300,000 t of MSW shall be dumped at the Talia landfill. This would lead to additional emissions of substantial amounts of methane in future.

At the attached landfill "Hagal" to the south of the landfill Talia, there is already a landfill gas system installed. Currently all landfill gas is flared due to contractual obligation of this landfill. There is a plan to connect this landfill gas system by a pipeline to the Talia landfill for joint utilisation of this landfill gas. This would have environmental advantages as the landfill gas from the Hagal landfill could be used for energy generation and the technical quality of the flares can be improved. As the Hagal site has the landfill gas extraction due to contractual obligations, only the additional electricity generation will be credited. In the monitoring plan the formula to exempt gas deliveries from the Hagal site from the methane emissions baseline will be described in detail.

The contract about delivery of 400-500m^3 of landfill gas to Talia could not be concluded in time of the beginning of the CDM project activity. In case negotiations will be successful additional gas analysers will be installed to establish the exact amount of methane gas that is added to the system from the Hagal site. The verifier will be informed about this situation and related necessary changes in the monitoring equipment in time.

Israel adopted a formal Energy Policy in 1998 that prepared the way for promotion of renewable energy. In 2002, the government of Israel prepared a formal policy paper on renewable energy (including landfill gas) that gives a sound legal framework for renewable energy projects. The implementation of landfill gas projects is in full accord with the renewable energy policy and the overall energy policy of the government of Israel. However, the policy does not provide sufficient financial incentives to implement such projects. Therefore, the CDM is a key to enhance revenues that allow landfill gas recovery to become commercially viable.

Direct emission reductions due to methane combustion:
Due to anaerobic conditions within a landfill, the biogenic fraction of the waste is digested by micro organisms and methane is generated. This methane is constantly pressed outwards until it leaves the landfill body to the atmosphere. The project envisages to collect a large part of this methane by a system of landfill gas wells and transport tubes. With the energy of the blower the landfill gas is drawn inside the system and either combusted to CO_2 within the generator facility or a flare. Without the proposed project the methane would be emitted to the atmosphere completely.

Indirect emission reductions due to displacement of fossil fuel-based electricity generation:
The renewable electricity produced by the project replaces conventional produced electric power in the national grid. The Israeli grid is served mainly by fossil fuel-based power plants.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

Year	LFG emission reduction per hour (m^3)	CH_4 reduction per year[1] (t)	CO_2 reduction from CH4 combustion per year (t)	CO_2 reduction from LFG-driven power production (2MWel)[2]	Annual estimation of emission reductions (t CO_2 e)
2006	995	2852	59 910	13 392	73 302
2007	939	2692	56 538	13 392	69 930
2008	887	2543	53 407	13 392	66 799
2009	837	2399	50 396	13 392	63 788
2010	790	2265	47 566	13 392	60 958
2011	746+ 276 =1022	2930	61 530	13 392	74 922
2012	704+ 483= 1187	3403	71 463	13 392	84 855
Average annual reductions	7.6 million[3]	2726	57 258	13 392	**70 650**
Total estimated reductions	53 million[3]	19 084	400 810	93 744	494 554

Due to the arid conditions of Israel and the imperfect technology of deposing waste, it is likely that the actual reductions are lower than in the calculation based on ACM 0001.
The additional landfill gas deliveries from the Hagal site could increase the volume of emission reductions by approximately 5000 t per year and have therefore no influence on the level of the registration fee.
The projected maximal emission reductions for the first crediting period is less than 100 000 t CO_2 eq. per year. In the second and third period emission reductions of above 200 000 t per year are possible due to future delivery of waste and expansion of the system.

A.4.5. Public funding of the project activity:

None

[1] Calculation with 8000 hours operation per year
[2] According to the National Electricity Authority for Israel (Annual Report 2003), the average grid emissions factor is 837 g CO_2/kWh.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

ACM0001 "Consolidated baseline methodology for landfill gas project activities"

Small scale methodology I.D. "Renewable electricity generation for a grid"

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

Following the applicability quoted in the methodology ACM0001
a) The captured gas is flared; and
c) The captured gas is used to produce energy (e.g. electricity/thermal energy), and emission reductions are claimed for displacing or avoiding energy generation from other sources.

The capacity of the generator is less than 15 MW, thus the small scale methodology I.D. "Renewable electricity generation for a grid" can be applied.

B.2. Description of how the methodology is applied in the context of the project activity:

B.2.1. Concerning how the consolidated baseline methodology in LFG project activities is applied to the project

a) According to ACM 0001, annual emissions reductions are the difference between the amount of methane that would have been destroyed in the absence of the project activity ($MD_{reg,y}$) multiplied by an adjustment factor (AF) and the amount of methane actually destroyed by the project ($MD_{project,y}$). As there is no regulation on landfill gas capture and use in Israel, $MD_{reg,y}$ is zero. The AF is the ratio of the quantity of LFG that should be collected in the baseline scenario to the quantity of LFG that is collected in the project. Due to the absence of such a regulation, the adjustment factor AF is also set to zero.
According to security regulations in Israel, it is necessary to guarantee that the level of the methane concentration at the surface of the landfill is not to exceed 5%. For this purpose it is business as usual to build safety wells that lead the landfill gas without any further treatment directly into the atmosphere where it gets diluted with ambient air. Therefore there is no reduction of methane by biogenic processes in the soil layer at the top of the landfill in the baseline scenario.
To estimate landfill gas generation by the landfill, the First Order Decay Model will be applied going back to 1977 when Talia landfill site was first commissioned. The methane gas collection efficiency is determined by the system performance. In the PDD, a uniform empirical value is set based on the system specifications.
The real quantity of flared landfill gas will be measured in the monitoring ex-post. In the PDD, it is assumed that the collected LFG not used for power generation will be flared. The methane fraction of the landfill gas will be measured continuously. In the PDD, the projected fraction is used.
In case additional landfill gas will be added to the system from landfills that are not part of the baseline, the volume of methane gas that is added is subtracted from the volume of landfill gas flared and used for energy generation.

b) Baseline emissions from electricity production are calculated as follows: The quantity of electricity actually supplied to the Israeli grid (minus power purchased from the grid) is multiplied by the grid emissions factor. According to small scale methodology I.D., the grid average emission factor can be used.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

Additionality is determined according to the procedure defined in the consolidated tool for demonstration of additionality agreed by the CDM Executive Board at its 16th session.

Step 0: Preliminary screening based on the starting date of the project activity

Since the project is not scheduled to start before the date of registration, this step can be skipped.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity

Scenario 1: The landfill would continue current practice and landfill gas would be emitted uncontrolled

Scenario 2: Landfill gas is recovered and used for electricity generation

Sub-step 1b. Enforcement of applicable laws and regulations

Israeli landfill regulations require that the methane concentration in the landfill surface have to remain below 5%. In the business as usual scenario this would lead to the construction of safety-wells that lead the landfill gas out of the landfill body directly into the atmosphere.

Step 2: Investment Analysis

As the project generates revenues from electricity sales, a benchmark analysis is undertaken. The IRR of the project is compared to the commercial lending rate applicable in Israel.

Sub-step 2b. – Option II. Apply benchmark analysis

The investment cost of the first phase of the project encompassing 2 MW electricity generation is 5.1 million USD (1.9 million for the gas collection system, the remainder for the Jenbacher engines and related civil works). Annual operating costs are estimated at 0.52 million USD while revenues from optimistically estimated electricity sales reach 0.96 million USD (16 GWh at 0.06 USD). At a cut-off time for the cash flow of 15 years and a discount rate of 12%, the IRR of the project is 2.73%
The commercial lending rate of the Bank of Israel in early 2005 was 11.5%.[3] The project is thus clearly less attractive than the benchmark.

Step 3: Barrier Analysis

Not implemented as the investment analysis clearly shows that the project is additional.

---

3 See Bank of Israel (2005): Main economic data, Lending rate exceptional credit, March 2005, http://www.bankisrael.gov.il/deptdata/mehkar/indic/eng_a6.htm

Step 4. Common Practice Analysis

From over 31 landfills in Israel, there are only 5[4] with landfill gas extraction. No closed landfill has a gas extraction system[5].
There is no regulation or enforcement of the use of this technology for the Talia site.
The Hagal landfill in the south of the project site that has a landfill gas extraction system in place is a new development. The tender for operation of the landfill included a contractual requirement for landfill gas collection. The Talia site is old, already closed and property of public institutions. The situation is thus completely different from the Hagal site.

Step 5: Impact of CDM Registration

CER revenues until 2012 will increase IRR to a level that will make the project interesting for private investment (see Table below).

Revenues in million USD

	2006	2007	2008	2009	2010	2011	2012	2013[1]
Electricity sales	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
CER sale at 5 USD/CER		0.37	0.35	0.33	0.32	0.30	0.37	0.42

[1] Sale during true up-period for Annex B first commitment period assumed

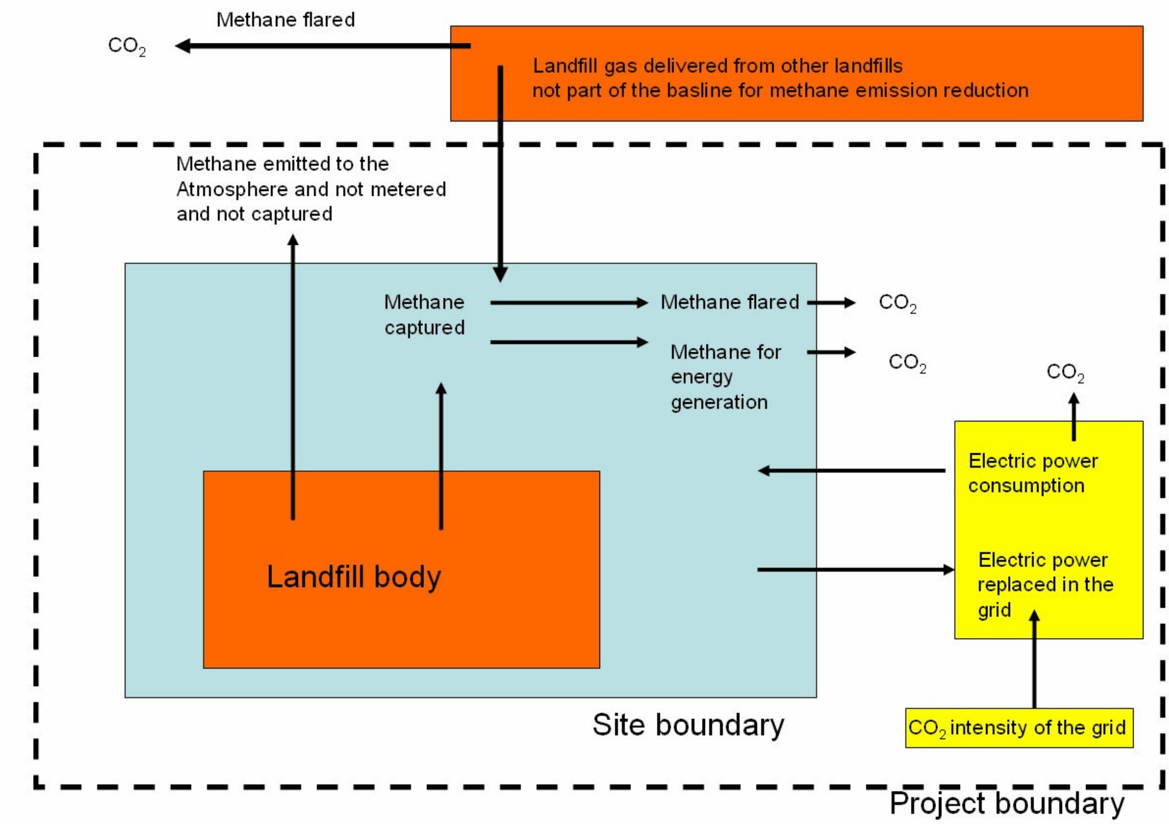
If pre-2012 CERs are sold at 5 USD per unit in the year in which they have been issued (as shown in the Table) and post-CERs are assumed to have no value due to the uncertainty about the post-2012 climate policy regime, the IRR rises to 9.21%.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

According to the consolidated baseline methodology, the project boundary includes the activity where the gas is captured and destroyed / used. Therefore the CO_2 emission from the flare and engines is included. In addition, the energy that is required for operation of this project should be included in the project emissions and should be monitored. Furthermore, according to the category I.D. of the small-scale CDM methodology, the project boundary should encompass the site of the renewable generation source as well as the grid which is supplied by this source.

[4] Own estimate

[5] "Of 31 landfills in Israel that have ceased operation, none has installed a landfill gas capture and combustion system" (Source: PDD of Hiriya landfill CDM project, p. 13). Hiriya landfill near Tel Aviv has been implementing a landfill gas capture system since August 2003 as a CDM project.



B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

Axel Michaelowa and Tobias Koch, Perspectives Climate Change GmbH, Ulrich Sawetzki, Energy Technology Solutions, 01/08/2005. Energy Technology Solutions is a project participant.

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/03/2006

C.1.2. Expected operational lifetime of the project activity:

21 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

01/04/2006

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

Section left blank on purpose

C.2.2.1. Starting date:

Section left blank on purpose

C.2.2.2. Length:

Section left blank on purpose

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

ACM 0001 "Consolidated monitoring methodology for landfill gas project activities"

Small scale methodology I.D. "Renewable electricity generation for a grid"

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

Following the applicability conditions quoted in the methodology ACM0001
a) The captured gas is flared; or
c) The captured gas is used to produce energy (e.g. electricity/thermal energy), and emission reductions are claimed for displacing or avoiding energy generation from other sources.
The production of electric power is less than 15 MW, thus the small scale methodology I.D. "Renewable electricity generation for a grid" can be applied.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

This section is left blank on purpose.

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

This section is left blank on purpose. Determination of baseline emissions is ex-post.

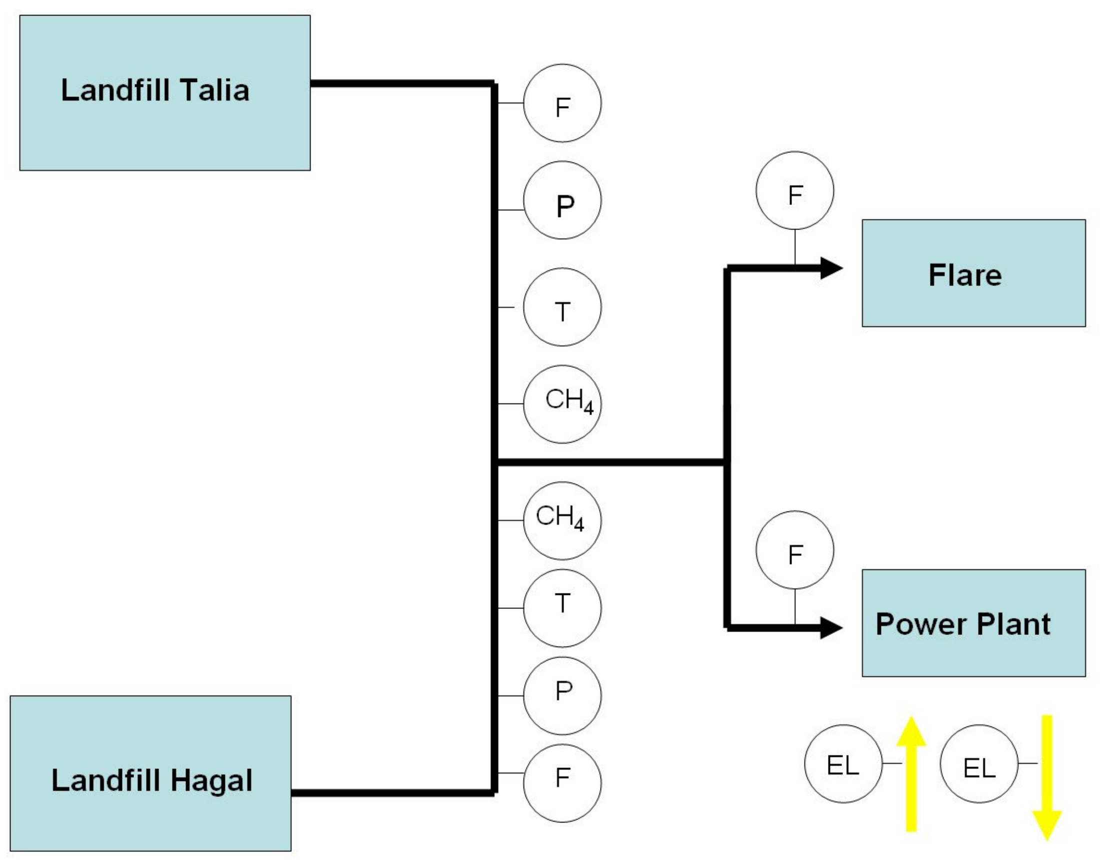
D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

This section is left blank on purpose. Determination of baseline emissions is ex-post.

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

This section is left blank on purpose. Determination of baseline emissions is ex-post.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).



Measurements:

CH_4 = Fraction of CH_4
T = Temperature
P = Pressure
F = Flow of LFG (m^3)
EL = Electrical Power (input and output)
(Flare efficiency is not measured but taken from producer information)
The project activity regarding methane emissions reduction is limited to the Talia site. Landfill gas from Hagal is used only for power generation.

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	Total quantity of landfill gas captured	Flow meter	m^3	m	Measured continuously and recorded monthly	100%	e	Data stored in the meter and electronically transmitted
2	Amount of landfill gas flared	Flow meter	m^3	m	Measured continuously and recorded monthly	100%	e	Data stored in the meter and electronically transmitted
3	Amount of landfill gas combusted in engines	Flow meter	m^3	m	Measured continuously and recorded monthly	100%	e	Data stored in the meter and electronically transmitted
4	Amount of landfill gas combusted in boiler	Flow meter	m^3	m	Measured continuously and recorded monthly	100%	e	Installation of boiler is not planned, thus these data do not need to be monitored.
5	Flare efficiency	Manufacturer of the flare	%	e	Once, at start of the project	NA	Written Document	Efficiency of the flare is determined by the design. The data provided by the manufacturer is more conservative than own measurements because of technical reasons described in Annex 4 e.
6	Methane fraction in the landfill gas	Methane analyser	%	m	continuously	100%	e	Data stored in the meter and electronically transmitted
7	Temperature of the landfill gas	Electronic thermometer	K	m	continuously	100%	e	Data stored in gas analyser and electronically transmitted.
8	Pressure of landfill gas	Electronic pressure gauge	Pa	m	continuously	100%	e	Data stored in gas analyser and electronically transmitted.

9	Total amount of energy acquired from external sources to operate the equipment	Electricity meter & Invoice	MW	m	Annually	100%	Electronically & written invoice	The reading from the electricity meter is recorded. Moreover, official invoice from the national grid operators will be used. In case of discrepancies, the lower value will be used.
10	Emission factor of energy acquired from external sources to operate the equipment	IPCC inventory guidelines	t CO_2/GJ	Quote from official sources	At beginning of project (ex-ante because electricity production component is small scale 1.D)	100%	Written document	This is differentiated according to the type of energy (electricity, gas, …)
11	Landfill regulation	Israel government gazette	Mandated LFG collection rate	Quotation from official sources	At beginning of project (ex-ante because electricity production component is small scale 1.D)	100%	Written document	Required for changes in baseline methane emissions rate or adjustment factor
12	Total amount of electricity sold to the grid operator	Electricity meter & Invoice	MW	m	Annually	100%	Electronically & written invoice	The reading from the electricity meter is recorded. Moreover, official invoice from the national grid operators will be used. In case of discrepancies, the lower value will be used.
13	Average grid emission factor	Official sources	t CO_2/MWh	Quotation from official sources	At beginning of project	100%	Written document	Official source by Israeli government
14 a expansion option	Total quantity of landfill gas received from other landfill	Flow meter	m^3	m	Measured continuously and recorded monthly	100%	e	Data stored in the meter and electronically transmitted
14 b expansion option	Pressure of landfill gas received from other landfill	Electronic pressure gauge	Pa	m	continuously	100%	e	Data stored in gas analyser and electronically transmitted.
14 c expansion option	Temperature of the landfill gas received from other landfill	Electronic thermometer	K	m	continuously	100%	e	Data stored in gas analyser and electronically transmitted.
14 d expansion option	Methane fraction in the landfill gas received from other landfill	Methane analyser	%	m	continuously	100%	e	Data stored in gas analyser and electronically transmitted.

Additional data to be monitored:
The verifier will receive information on how the light of the flare will attract birds and what kind of measures where taken to prevent death of birds due to the exhaust of the flare.

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

Based on the formulae in the methodology ACM 0001:

Emission reduction per year:
$ER_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH4} + EG_y * CEF_{electricit,y}$

Methane destroyed per year due to regulatory requirements
$MD_{reg,y} = MD_{project,y} * AF$ (in this case zero as there are no requirements)

Adjustment Factor for regulatory obligations to reduce methane emissions:
AF= zero
Explanation: There are no regulatory requirements in 2005 in Israel

Methane destroyed per year:
$MD_{project,y} = MD_{flared,y} + MD_{electricity,y}$
Explanation: The exact amount of methane destroyed is calculated from the main volume meter

Methane destroyed in the flare:
$MD_{flared,y} = LFG_{flared,y} * w_{CH4,y} * D_{CH4} * FE$ (only for verification purpose)
Explanation: The exact amount of methane destroyed is calculated from the main volume meter

Methane destroyed in the engine for power production:
$MD_{electricity,y} = LFG_{electricity,y} * w_{CH4,y} * D_{CH4}$ (only for verification purpose)
Explanation: The exact amount of methane destroyed is calculated from the main volume meter

Electricity generation:
EG_y = Electricity generated per year – electricity consumed per year

Greenhouse gas emission reduction from electricity production:
$CO_{2\ avoided,\ y} = EGy * CEF_{electricity}$ (as provided by official sources)

Methane density:
$D_{CH4} = 0.0007168 * (P/101.3) * (273.15/T)$

Explanation: The specific gravity of methane gas (D_{CH4}) is the specific gravity ($0.0007168 t/Nm^3$) (according to the consolidated monitoring method) of methane gas in the standard state (101.3kPa, 0°C = 273.15K) with correction for actual temperature (T = ID2) and pressure (P = ID3).

Global warming potential of CH_4:
GWP CH_4 = 21t CO_2e/tCH_4

Flare Efficiency:

FE = 99% (as stated by the manufacturer of the flare in Annex 6.1)
Explanation: This way more conservative data can be used than through measurement, as no technical norms for a measurement of methane in flare exhaust exist.

Project emissions:
$(LFG_{flared,y} + LFG_{electricity,y}) / EqC - (LFG_{flared,y} + LFG_{electricity,y}) + LFG_{flared,y} * (1 – FE)) * w_{CH4,y} * D_{CH4} * GWP_{CH4}$
Explanation: The project emission = methane emission by the landfill - collected methane by the project + methane emission from flare

Optional expansion:
In case additional landfill gas from other sources is added to the system for flaring and electricity production, this additional amount of methane has to be deducted from the amount of landfill gas flared and utilised in the engines.
$(MD_{flared,y} + MD_{electricity,y})$ - amount of methane from other source = $MD_{project,y}$

D.2.3. Treatment of leakage in the monitoring plan

No leakage effects need to be accounted under this methodology.

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

No leakage effects need to be accounted under this methodology.

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

No leakage effects need to be accounted under this methodology.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

See formulae in **D.2.2.2**

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1-Flow Meter	Low	Initial calibration documented by the producer. Regular service according to the recommendations of the producer and recorded in the plant-journal. Description of accuracy by the producer is added in the annex. Documentation of initial calibration is provided to the verifier.

2 Flow Meter Flare	Low	Initial calibration documented by the producer. Regular service according to the recommendations of the producer and recorded in the plant-journal. Description of accuracy by the producer is added in the annex. Documentation of initial calibration is provided to the verifier.
3 Flow Meter Generator	Low	Initial calibration documented by the producer. Regular service according to the recommendations of the producer and recorded in the plant-journal. Description of accuracy by the producer is added in the annex. Documentation of initial calibration is provided to the verifier.
4 Flow Meter Boiler	Does not apply	Does not apply
5 FE	Medium **Statement:** *In contrast to the Methodology we assess the degree of uncertainty of regular check of flare efficiency as "very high"*	The flare is subject to regular maintenance as recommended by the producer. ***Statement:*** *There is no known technical procedure / official standard to measure methane emissions from flares as demanded in the methodology. Therefore, the efficiency level stated in the technical specification from the producer of the flare will be used (see Annex 4 e).* *Any recommendations by the CDM Executive Board concerning direct measurement of flare efficiency will be implemented once they become available.*
6 Methane Content	Low	The gas analyser is subject to regular calibration with calibration gas as prescribed by the producer. Calibration of the gas analyser is recorded in the plant-journal. Equipment has to have an accuracy of more than 95% according to the producer. Description of accuracy by the producer is added in Annex 4 e. Documentation of initial calibration is provided to the verifier.
7 Temperature	Low	Regular service according to the recommendations of the producer and recorded in the plant-journal.
8 Pressure	Low	Regular service according to the recommendations of the producer and recorded in the plant-journal.
9 Electricity intake	Low	Data are supplied by electricity distribution utility; as the utility is interested to collect the revenues, these data are likely to be accurate.
10 CO_2 intensity of grid power	Low	Data from statistics issued by the Israel government are likely to be accurate.
11 Regulatory requirements	Low	Data supplied by the Israel government are likely to be accurate
12 Electric power sold to the grid	Low	Sales receipts from the buying utility company are likely to be accurate as the utility has no incentive to over-report its power acquisition
13 Average grid emission factor	Low due to small size of country	Supplied by official sources in Israel
14 Methane from other source	Low	High accuracy as 1,2,3,6,7,8. Flow meter Nr.1 can be used for control purposes.

More detailed information can be found in the monitoring plan in Annex 4

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

In the project, quality control and quality assurance are carried out by the following methods.
- The project implementing organization will consist of operating personnel and management. Both will be assigned by Madei Tas Ltd.
- Management will prepare written procedures for operating facilities.
- Written procedures, containing daily work schedules, periodic maintenance methods and judgment criteria, etc., will be compiled according to appropriate formats.
- Operating personnel will be assured recurrent opportunities to receive training in order to enable them to carry out work according to the above procedures.
- Operating personnel will work according to the above procedures and will report results to management.
- Management will check reports from operating personnel and determine whether there are problems according to the procedures. If problems are found in such checks, management will implement the appropriate countermeasures with appropriate timing.
- Management will file and store reports from operating personnel according to the procedures.
- Management will regularly patrol and visit work areas to audit that work is being appropriately implemented by operating personnel according to the procedures. If problems are found in such audits, management will implement appropriate countermeasures with appropriate timing.
- In the event of accidents (including the unforeseen release of GHG), management will ascertain the causes and implement countermeasures, including specific operation procedures for the operating personnel.
- Measuring instruments will be periodically and appropriately calibrated according to the procedures. Calibration timing and methods will be in accordance with the monitoring plan.
- Monitoring data will be constantly recorded by electronic means and monthly checked for completeness by a specialised company, that will compare electronically transmitted data with actual copies of the plant journal. Any kind of inconsistency will be investigated. The specialised company will compile the monitoring data to monthly and annual reports for the verifier.
- Measured data will be disclosed and open to public comment. Received comments and the steps taken in response to them will also be disclosed.

The detailed strategy for data storage and security is described in the Monitoring Annex 4b

D.5 Name of person/entity determining the monitoring methodology:

Axel Michaelowa and Tobias Koch, Perspectives Climate Change GmbH, Ulrich Sawetzki, Energy Technology Solutions,
Date: 01/08/2005.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

Emissions from combustion of landfill gas:

This emissions are from renewable biomass and therefore not anthropogenic. Actual emissions will be determined ex post through monitoring.
There is a minor source of methane emissions due to incomplete combustion of methane in the flare that is far less than 1% of the GHG reduction potential of the project activity.

E.2. Estimated leakage:

No leakage effects need to be accounted under this methodology.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

See E.1.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

Estimated baseline emissions are:

Greenhouse gases released in the baseline are
(Methane released by the landfill) * GWP CH_4 + (electricity produced * CO_2 emission intensity of the electricity displaced)

For estimates see Table E.6 below. Actual emissions will be determined ex post through the monitoring plan.

Optional expansion:
The methane emissions from the Hagal landfill are not part of the project baseline whereas the emissions from electricity substituted by electricity generated by the methane collected from Hagal landfill are added to the baseline.

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

Estimated annual emission reductions are listed in the table under E.6. They will be measured ex- post

E.6. Table providing values obtained when applying formulae above:

Year	Estimation of baseline emissions in tonnes of CO_2 e	Estimation of project activity emissions in tonnes of CO_2 e[6]	Annual estimation of emission reductions in tonnes of CO_2 e
2006	73 302	0	73 302
2007	69 930	0	69 930
2008	66 799	0	66 799
2009	63 788	0	63 788
2010	60 958	0	60 958
2011	74 922	0	74 922
2012	84 855	0	84 855

[6] Flare emissions are not taken into consideration for this calculation as they are far less than 1% of the GHG emission reduction potential of the project activity. However potential flare emissions are subject to monitoring of actual emission reductions.

Annual average over the crediting period	**70 650**	0	**70 650**
Total estimated reductions	494 554	0	494 554

Optional expansion (landfill gas from other landfills) can increase the baseline emissions marginally due to fossil fuels used for electricity production as this landfill gas is already flared currently (approximately 5000 t per year).

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

Water:
Due to the very dry conditions in the area there will be only negligible amounts of lactate water being condensed from the landfill gas that can be reinjected in the landfill.

Air:
The air quality will be considerably increased due to controlled combustion of the landfill gas instead of uncontrolled emission. In addition the operation of the plant will reduce the possibility of fires on the landfill due to better observation. The flare is especially adopted for the combustion of landfill gas and complies with the air-pollution requirements in Israel.

Biodiversity:

There is minimal impact due to construction of the landfill gas wells and tube system. After the construction will be finished the conditions for wildlife on the territory of the landfill will be improved due to reduced methane emissions. All animals and especially reptiles that will be discovered during the construction will be placed in the similar landscape outside the construction site.
Due to the operation of the flare birds and insects could be attracted at night and perish due to the high exhaust temperature. It has to be taken into consideration to build additional shields on the flare to prevent light emission or to prevent birds in other ways to come too close to the flare.
Any special measures will be reported to the verifier.

Noise:
The operation of the blower, engines, flare will produce considerable noise. As there are no settlements close to the landfill noise pollution is not causing any problems

Consumption of ground:
All construction will be on the area of the landfill that is not utilised.

Social issues:
The plant operation will create 2-3 later up to 15 permanent jobs.
Living conditions in the surrounding villages will be improved due to reduced odours.

Health:
Due to the regular observation of the landfill the likelihood of fires will be reduced and therefore the emission of especially harmful products of uncontrolled combustion.
The employees of the landfill gas plant will receive suitable immunisations.

Transboundary impacts:
There are no significant transboundary impacts

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

An environmental impact study is not required by the host party.
The generator and flare greatly improves the environmental impact of the existing landfill due to the suppression of odours and the reduction of burning of fossil fuels in existing fossil power plants.

SECTION G. Stakeholders' comments

>>

G.1. Brief description how comments by local stakeholders have been invited and compiled:

דברים שרואים מכאן

יישום פרוטוקול קיוטו באתר הטמנה 'טליה'

ב"אתר טליה", נפלטת באופן סדיר גז מתאן. גז מתאן זה ייאסף בעזרת קידוחים במטמנה, יובל אל לפיד לשריפה או אל מנוע לייצור חשמל

ירדן של שלום

בעשרה ביולי, התכנסו לראשונה באתר ירדנית, ישראלים ירדנים ופלסטינים וקפצו יחד אל נהר הירדן לקרוא להצלתו. האירוע יתקיים במסגרת פרויקט בינלאומי להצלת נהרות גוועים ברחבי העולם בשם BIG JUMP

המשך בעמוד 16

יוזמה חדשה בייזום עסקי וכח אדם

לאחרונה החליטו המועצה האזורית והמפעלים האזוריים על יוזמה משותפת חדשה לטיפול אזורי מקצועי בנושאי השמת כח־אדם, ייזום פרוייקטים וגישור

יחידת ייזום וניהול פרוייקטים עיסקיים

יחידת גישור תעסוקתי - כלכלי

יחידת השמה

משמנת טליה

הזמנה לכנס

בענין ישום פרוטוקול קיוטו

השותפות מטמנת טליה מזמינה את הציבור לכנס בנושא ישום פרוטוקול קיוטו באתר טליה.

במהלך הכנס ינתן הסבר על השיטות והתוכניות לישום הפרוטוקול.

לציבור תינתן אפשרות לשאלות והבהרות.

הכנס יתקיים באולם המועצה בתאריך 11/9/05 בין השעות 10:00-11:00

הציבור מוזמן

ARTICAL IN THE NEWSPAPER ON THE APPLICATION IN TALIA

INVITATION FOR THE PUBLIC HEARING

14 אוגוסט 2005

AUGUST 2005

>>

G.2. Summary of the comments received:

Protocol of Public Hearing **Concerning** CDM - Talia Landfill Site

Location: Regional council Emek Hayarden building
Date: 11th September, 2005
Participants:
Dudu Alter – General Manager of Talia Ladfill Site
Eli Matz – General Manager of Madei Taas Ltd.
Public audience:
1. Omer Cohen, ID 02282947-7,Kibbutz Ashdot Yaakov Ichud, Jordan Valley, 15155
2. Ronit Srur, ID 022427454. Golani road, Tiberius
3. Galia Sela , ID 05065504-2 , Libbutz Genosar
4. Maori Israel, ID 054004254 . Moshav Kineret
5. Yacov Shen , Kibutz Shaar Ha-Golan, 15145
6. Giyora Astary , ID 024352718 , Kibutz Maagan, 15160
7. Anat Graidi , ID 024352718 . Zabotinski, Tiberius 108214
8. Binyamin Miriam, ID 30615488, Ha-Arazim 47, Tiberius
9. Kabesa Zippy , ID 59282590 , Ha-Narkis 409/11, Tiberius 14279
10. Mira Nidbach, ID 50351501, Kibbutz Gesher, D.N. Emek Hayarden

Schedule of hearing
Eli Matz lectured for an half an hour regarding the aim of Kyoto protocol and the implementation of the project at Talia landfill site including description of collecting gas from the landfill. He elaborated on the benefits of gas collection to the public.

1. Question by participant no. 3:
Is the electricity that produced from the methane will be enough for all the Kibbutzim in the region?
Answer by Eli Matz:
The installed power in the landfill would start from 1 MW and would be increased up to 3 MW. Obviously it will not be enough for all Kibbutzim in the area but we can estimate that 2-3 of them can enjoy this power.

2. Question by participant no. 9:
Can the power be wheeled through the main grid or parallel wires should be installed to distribute the electricity?
Answer by Eli Matz:
No parallel cabling should be installed. All power would be delivered through the main grid.

3. Question by participant no. 9:
Who will finance the project?
Answer by Dudu Alter:
The gas collection system project and the power station would be financed by the union of cities and by the income from the sales of the CDM.

4. Question by participant no. 1:
Is the electricity that would be produced by the methane from the landfill would be cheaper than the one supplied by the Israel Electricity Company?
Answer by Dudu Alter:
Yes, it will be cheaper by about 6-8% compared to the one supplied by the IEC.

5. Question by participant no. 6:
Is all the gas that would be produced in the landfill will be collected through the piping or would there by some leakages through the landfill to the surrounding?
Answer by Dudu Alter:
The aim of the piping collection system is to work in certain vacuum to ensure no leakages to the surrounding but only collection to the piping.

6. Question by participant no. 8:
What is the forecast for revenues from the CDM?
Answer by Eli Matz:
The income depends on the actual equivalent CO_2 savings and the market price for CERs. However, the business plan and report are open for your evaluation at the union office, please feel free to look on it.

7. Question by participant no. 2:
In the end of the day – is this application will make the air surrounding cleaner for us?
Answer by Eli Matz:
Definitely yes. The methane emission from the landfill harms the surrounding and damages the atmosphere and ozone layer. Preventing these emissions would definitely increase the quality of our environment.

G.3. Report on how due account was taken of any comments received:

It was not necessary to change the planning due to public comments as the project found general acceptance.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Madei Taas Ltd
Street/P.O.Box:	21 Hamelacha st.
Building:	
City:	Rosh Aayin
State/Region:	
Postfix/ZIP:	48091
Country:	Israel
Telephone:	+972 3 9027174
FAX:	+972 3 9027176
E-Mail:	mail@madeitaas.co.il
URL:	www.madeitaas.co.il
Represented by:	
Title:	M.Sc Eng.
Salutation:	Mr.
Last Name:	Matz
Middle Name:	-
First Name:	Eli
Department:	Director
Mobile:	+972544248271
Direct FAX:	+97235422664
Direct tel:	+97239027174
Personal E-Mail:	elimatz@madeitaas.co.il

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding was involved

Annex 3

BASELINE INFORMATION

Amount of waste:

Amount of waste dumped at the landfill from 1978-1999

Year	**Waste (tonnes)**
1978	**55,000**
1979	**55,000**
1980	**55,000**
1981	**55,000**
1982	**55,000**
1983	**55,000**
1984	**55,000**
1985	**55,000**
1986	**55,000**
1987	**90,000**
1988	**100,000**
1989	**111,000**
1990	**114,000**
1991	**100,000**
1992	**160,000**
1993	**180,000**
1994	**190,000**
1995	**200,000**
1996	**238,200**
1997	**239,400**
1998	**263,000**
1999	**320,000**
Total 1978-1999	**2,800,600**
2000	**0**
2001	**0**
2002	**0**
2003	**0**
2004	**0**
2005	**0**
2006	**0**
2007	**0**
2008	**0**

2009	**300 000**
2010	**300 000**
2011	**300 000**
2012	**300 000**

Landfill Gas Quantity Calculation

HOFSTETTER

Project: **Talia**

Calculation No.: **01-min.**

-Start of waste depositing:	1978	year
-Organic carbon in the waste:	180	kg/to
-Temperature in the Landfill mass:	25	°C
-Parameter of gasification speed:	0.025	-
-Methane content in the Landfill gas:	50	vol%
-Calorific value of the landfill gas:	5	kW

Degree of gasification after:

20 years	69	%
30 years	82	%
50 years	95	%

Year	Deposited waste to	Degass. percent %	Collect. quantity %	Quantity degass.waste to	Produced gas quantity m^3/h	Collectable gas quantity m^3/h	Cumulated gas $m^3 x10^6$	Power potential kWh/h	Energy potential GWh
1978	55'000	80	0	44'000	0	0	0	0	0
1979	55'000	80	65	44'000	60	39	0.3	193	1.7
1980	55'000	80	65	44'000	116	75	1.0	376	5.0
1981	55'000	80	65	44'000	169	110	2.0	548	9.8
1982	55'000	80	65	44'000	219	142	3.2	711	16.0
1983	55'000	80	65	44'000	266	173	4.7	865	23.6
1984	55'000	80	65	44'000	311	202	6.5	1'010	32.4
1985	55'000	80	65	44'000	353	229	8.5	1'147	42.5
1986	55'000	80	65	44'000	393	255	10.7	1'276	53.7
1987	90'000	80	65	72'000	430	280	13.2	1'398	65.9
1988	100'000	80	65	80'000	504	327	16.1	1'637	80.3
1989	111'000	80	65	88'800	584	379	19.4	1'897	96.9
1990	114'000	80	65	91'200	671	436	23.2	2'181	116.0
1991	100'000	80	65	80'000	757	492	27.5	2'460	137.5
1992	160'000	80	65	128'000	823	535	32.2	2'674	160.9
1993	180'000	80	65	144'000	950	617	37.6	3'087	188.0
1994	190'000	80	65	152'000	1'092	710	43.8	3'548	219.1
1995	200'000	80	65	160'000	1'236	803	50.9	4'017	254.3
1996	238'200	80	65	190'560	1'383	899	58.7	4'496	293.6
1997	239'400	80	65	191'520	1'564	1'016	67.6	5'082	338.2
1998	263'000	80	65	210'400	1'735	1'128	77.5	5'640	387.6
1999	320'000	80	65	256'000	1'923	1'250	88.5	6'249	442.3
2000	0	80	65	0	2'162	1'405	100.8	7'025	503.9
2001	0	80	65	0	2'041	1'326	112.4	6'632	562.0
2002	0	80	65	0	1'927	1'252	123.4	6'261	616.8
2003	0	80	65	0	1'819	1'182	133.7	5'911	668.6
2004	0	80	65	0	1'717	1'116	143.5	5'580	717.5
2005	0	80	65	0	1'621	1'054	152.7	5'268	763.6
2006	0	80	65	0	1'530	995	161.4	4'973	807.2
2007	0	80	65	0	1'445	939	169.7	4'695	848.3
2008	0	80	65	0	1'364	887	177.4	4'433	887.1
2009	0	80	65	0	1'288	837	184.8	4'185	923.8
2010	0	80	65	0	1'216	790	191.7	3'951	958.4
2011	0	80	65	0	1'148	746	198.2	3'730	991.1
2012	0	80	65	0	1'083	704	204.4	3'521	1'021.9
2013	0	80	65	0	1'023	665	210.2	3'324	1'051.0
2014	0	80	65	0	966	628	215.7	3'138	1'078.5
2015	0	80	65	0	912	593	220.9	2'963	1'104.5
2016	0	80	65	0	861	559	225.8	2'797	1'129.0
2017	0	80	65	0	812	528	230.4	2'640	1'152.1
2018	0	80	65	0	767	499	234.8	2'493	1'174.0
2019	0	80	65	0	724	471	238.9	2'353	1'194.6
2020	0	80	65	0	684	444	242.8	2'222	1'214.0
2021	0	80	65	0	645	419	246.5	2'097	1'232.4
2022	0	80	65	0	609	396	249.9	1'980	1'249.7
2023	0	80	65	0	575	374	253.2	1'869	1'266.1
2024	0	80	65	0	543	353	256.3	1'765	1'281.6
2025	0	80	65	0	513	333	259.2	1'666	1'296.2
2026	0	80	65	0	484	315	262.0	1'573	1'309.9
2027	0	80	65	0	457	297	264.6	1'485	1'323.0
Total	**2'800'600**	to	Total	**2'240'480**	to				

Total gas quantity per ton of waste: **211** m^3 per 1 ton decomposable waste

Landfill Gas Quantity Calculation

HOFSTETTER

Project: **Talia future dumping - min. gas production**

Calculation No.: **02**

-Start of waste depositing:	2009	year
-Organic carbon in the waste:	180	kg/to
-Temperatur im Müllkörper:	25	°C
-Parameter of gasification speed:	0.025	-
-Methane content in the Landfill gas:	50	vol%
-Calorific value of the landfill gas:	5	kW

Degree of gasification after:

20 years	69	%
30 years	82	%
40 years	95	%

Year	Deposited waste to	Degass. percent %	Collect. quantity %	Quantity degass.waste to	Produced gas quantity m^3/h	Collectable gas quantity m^3/h	Cumulated gas m^3x10^6	Power potential kWh/h	Energy potential GWh
2009	300'000	70	0	210'000	0	**0**	0	0	0
2010	300'000	70	0	210'000	284	**0**	0.0	0	0.0
2011	300'000	70	50	210'000	552	**276**	2.4	1'381	12.1
2012	300'000	70	60	210'000	805	**483**	6.7	2'416	33.3
2013	300'000	70	70	210'000	1'044	**731**	13.1	3'656	65.3
2014	300'000	70	70	210'000	1'270	**889**	20.8	4'445	104.2
2015	300'000	70	70	210'000	1'483	**1'038**	29.9	5'191	149.7
2016	300'000	70	70	210'000	1'684	**1'179**	40.3	5'895	201.3
2017	300'000	70	70	210'000	1'874	**1'312**	51.8	6'559	258.8
2018	300'000	70	70	210'000	2'053	**1'437**	64.3	7'187	321.7
2019	300'000	70	70	210'000	2'222	**1'556**	78.0	7'779	389.9
2020	300'000	70	70	210'000	2'382	**1'668**	92.6	8'338	462.9
2021	300'000	70	70	210'000	2'533	**1'773**	108.1	8'866	540.6
2022	300'000	70	70	210'000	2'675	**1'873**	124.5	9'364	622.6
2023	300'000	70	70	210'000	2'810	**1'967**	141.8	9'834	708.8
2024	300'000	70	70	210'000	2'937	**2'056**	159.8	10'278	798.8
2025	0	70	70	0	3'056	**2'140**	178.5	10'698	892.5
2026	0	70	70	0	2'886	**2'020**	196.2	10'099	981.0
2027	0	70	70	0	2'724	**1'907**	212.9	9'534	1'064.5
2028	0	70	70	0	2'572	**1'800**	228.7	9'001	1'143.4
2029	0	70	70	0	2'428	**1'700**	243.6	8'498	1'217.8
2030	0	70	70	0	2'292	**1'604**	257.6	8'022	1'288.1
2031	0	70	70	0	2'164	**1'515**	270.9	7'573	1'354.4
2032	0	70	70	0	2'043	**1'430**	283.4	7'150	1'417.0
2033	0	70	70	0	1'929	**1'350**	295.2	6'750	1'476.2
2034	0	70	70	0	1'821	**1'274**	306.4	6'372	1'532.0
2035	0	70	70	0	1'719	**1'203**	316.9	6'016	1'584.7
2036	0	70	70	0	1'623	**1'136**	326.9	5'679	1'634.4
2037	0	70	70	0	1'532	**1'072**	336.3	5'362	1'681.4
2038	0	70	70	0	1'446	**1'012**	345.2	5'062	1'725.8
2039	0	70	70	0	1'365	**956**	353.5	4'779	1'767.6
2040	0	70	70	0	1'289	**902**	361.4	4'511	1'807.1
2041	0	70	70	0	1'217	**852**	368.9	4'259	1'844.4
2042	0	70	70	0	1'149	**804**	375.9	4'021	1'879.7
2043	0	70	70	0	1'084	**759**	382.6	3'796	1'912.9
2044	0	70	70	0	1'024	**717**	388.9	3'583	1'944.3
2045	0	70	70	0	967	**677**	394.8	3'383	1'973.9
2046	0	70	70	0	912	**639**	400.4	3'194	2'001.9
2047	0	70	70	0	861	**603**	405.7	3'015	2'028.3
2048	0	70	70	0	813	**569**	410.7	2'846	2'053.3
Total	**4'800'000**	to	Total	**3'360'000**	to				

Total gas quantity per ton of waste: **211** m^3 per 1 ton decomposable waste

Baseline Information concerning CO_2 intensity of the grid:
According to the National Electricity Authority for Israel (Annual Report 2003), the average grid emissions factor is 837 g CO_2/kWh.

Annex 4

MONITORING PLAN

a) Data source frequency, form of storage, quality control

Data source	Frequency of reading	Form of Data storage	Comments
1-Flow Meter and optional 2nd flow meter for gas from Hagal site	Continuously electronically on the meter Daily on Paper Monthly report Hourly by data transmission log	Electronically inside the meter On paper in the plant operation journal On paper in the monthly report Electronically in form of a txt document	Flow meter Vortex type. This type of flow meter does not have any moving parts and is resistant against aggressive gases typical for landfill gas. Information on the calibration by the manufacturer is documented. The accuracy is provided by calculations of the manufacturer, taking into account the range of gas-volume. All documents are available for the validator/verifier
2 Flow Meter Flare	Continuously electronically on the meter Daily on Paper Monthly report Hourly by data transmission log	Electronically inside the meter On paper in the plant operation journal On paper in the monthly report Electronically in form of a txt document	Flow meter Vortex type. This type of flow meter does not have any moving parts and is resistant against aggressive gases typically for landfill gas. Information on the calibration by the manufacturer is documented. The accuracy is provided by calculations of the manufacturer, taking into account the range of gas-volume. All documents are available for the validator/verifier
3 Flow Meter Generator	Continuously electronically on the meter Daily on Paper Monthly report Hourly by data transmission log	Electronically inside the meter On paper in the plant operation journal On paper in the monthly report Electronically in form of a txt document	Flow meter Vortex type. This type of flow meter does not have any moving parts and is resistant against aggressive gases typically for landfill gas. Information on the calibration by the manufacturer is documented. The accuracy is provided by calculations of the manufacturer, taking into account the range of gas-volume. All documents are available for the validator/verifier
4 Flow Meter Boiler	Left blank on purpose	Left blank on purpose	Left blank on purpose

5 FE	Documentation presented during validation/verification	Document by the manufacturer	Information on flare efficiency is provided by the manufacturer as there is no technical norm available how methane in the flare exhaust can be measured. Due to technical difficulties with measurement the manufacturer's specification guarantees a higher degree of conservativeness. The flare is subject to regular maintenance as prescribed by the manufacturer.
6 Methane Content	Continuously electronically on the meter Daily on Paper Monthly report Hourly by data transmission log	Electronically inside the meter every hour. Data continuously transmitted to panel PC On paper in the plant operation journal On paper in the monthly report Electronically in form of a txt document	The manufacturer states the accuracy of the methane analyser. The methane analyser is subject to regular calibration as prescribed by the manufacturer. The accuracy must be higher than 95% as demanded by the methodology.
7 Temperature	Continuously Daily on Paper Monthly report Hourly by data transmission log	Data transmitted to panel PC On paper in the plant operation journal On paper in the monthly report Electronically in form of a txt document	Standard device for electronic reading. Documentation by the manufacturer will be available for the validator/verifier.
8 Pressure	Continuously Daily on Paper Monthly report Hourly by data transmission log	Data transmitted to panel PC On paper in the plant operation journal On paper in the monthly report Electronically in form of a txt document	Standard device for electronic reading. Documentation by the manufacturer will be available for the validator/verifier.
9 Electricity intake	Official invoice documents every month	Original of the invoice	Bill to be supported by official power meter calibrated by the utility
10 CO_2 intensity of grid power	annually	Copy of official documents	As stated in the PDD ex-ante for the crediting period

11 Regulatory requirements	annually	Copy of official documents	Supplied regularly by official sources
12 Electric power sold to the grid	Official billing documents every month	Original of the bill	Official power meter calibrated by the utility

b) Procedure for data storage:

1st level: Data storage on meters

Flow meters:
There are electronic counters built in the flow meters. During any change of the meters a protocol will be immediately issued for the verifier.

The methane analyser:
An internal electronic storage for the data of the last year of operation.

Flare operation hours:
The operation hours of the flare will be counted by an operation hour counter

Engine operation hours:
The operation of the engine will be recorded by an operation hour counter

Electric meters:
The metered data is supported by values from official invoices.

2nd level: Data recording on the plant operation journal
At the beginning of every shift the operator's personnel will record following data in the plant operation journal:

- Time and date
- Name of person that conducts the data audit
- Counter of flow meter 1(general volume from Talia)
- Optional counter of flow meter 1b (general volume from Hagal)
- Counter of flow meter 2 (landfill gas to the flare)
- Counter of flow meter 3 (landfill gas to the generator)
- Actual % of methane in the landfill gas from Talia
- Optional actual % of methane in the landfill gas from Hagal
- Actual temperature of the landfill gas from Talia
- Optional actual temperature of the landfill gas from Hagal
- Actual pressure of the landfill gas from Talia
- Optional actual pressure of the landfill gas from Hagal
- Flare working status (Nr. of overall operation hours)
- Gas-Engine working status (Nr. of overall operation hours)
- Counter of power meter for energy consumption
- Counter of power meter for energy delivery to the grid
- Any calibration or service works on the metering devices
- Any other relevant actions and findings (death of birds near the flare, any accidents)

The data in the plant operation journal will be audited once a month by the operator management. Regular cross checks with the data on the meters and the data electronically stored serve as a tool for controlling the accuracy.
The operator management will issue a protocol each month and remove the operation journal from the plant to the office of the operator.
In the monthly protocol also the data from the billing of the local power utility will be recorded.
The monthly protocol will be photocopied and the copy placed in the plant while the original will stay at the office of the operator.
The original operation journal as well as the billing documents for power delivery will stay at the operators office at least 2 years after the end of the project activity.
The copies of the monthly protocol will stay at the plant until the end of operation.

3rd level: Data distance reading and electronically storage
A PC will compute the norm m^3 for methane out of the volume of landfill gas, the pressure, temperature and percentage of methane content in the landfill gas.
This data will be transmitted each hour together with the data of all flow meters and the actual methane concentration to a server via the internet.
It will be possible to access this data by the internet any time for the purpose of optimisation of the plant operation or verification. The data security of the server is very high due to professional operation and regular data backup.
However the data security of the build in meters or the plant journal is higher.
Prior to annual verification the online storage data has to be cross checked with the data recorded in the plant orations journal. In case of differences the data in the plant journal and on the meter counters has priority.

c) Procedures in case of loss of data:

Failure of flow meters:
It is possible to reconstruct the data of a single flow meter out of the data from the other remaining flow meters:

General flow meter = flow meter flare + flow meter engine
Flow meter flare= General flow meter – flow meter engine
Flow meter engine= general flow meter - flow meter flare
Any failure of a single meter will be recorded immediately after discovery in the plant operation journal.

Failure of the methane analyser:
As the methane content of the landfill gas will change only very slowly due to changing seasons or the reduced biologic activity of the waste, it is possible to estimate with high accuracy that the methane concentration in the landfill gas would be the same average value as in the previous week before the falure.
Any failure of the methane analyser will be recorded immediately after discovery in the plant operation journal and an replacement ordered as soon as technically possible.
During time of calibration, the last measured value will be used for ongoing calculations of methane concentration during the time of calibration (approximately 15 minutes per month)

Failure of pressure or temperature indicators:
The failure of this devices is immediately visible at least when a new shift will check the meter data.

As a landfill gas extraction plant will work under similar conditions for very large periods of time, the average data of the last week before failure can be used without compromising conservativeness of the measurement.
In case a methane meter, temperature meter or pressure meter will fail, it is possible to use the average value of the previous week before the meter failure for electronic calculation of the Methane mass until the meter has been replaced. Any meter malfunction has to be recorded as well how the data were reconstructed.

Failure of the flare:
Any failure of the flare to regularly ignite the landfill gas will cause an automatic shutdown of the blower. This security feature is built in by the producer of the flare and will not be altered. It is therefore impossible to emit landfill gas through the flare without combustion. However it would be still possible to use the gas engine to combust landfill gas.
Any failure of the flare system will be recorded immediately after discovery in the plant operation journal.

Failure of the gas engine:
In case the gas engine is out of order or during maintenance, landfill gas can be combusted only through the flare.
Any failure of the flare system will be recorded immediately after discovery in the plant operation journal.

Failure of the electric power meters:
The electric power meters are subject to independent control by the local utility. It is possible to assume that the utility will use a very conservative approach to calculate the amount of energy delivered to the grid, respectably the amount of power delivered to the plant.
The regular billing sheets are therefore always the resource for valid data.

Failure of the panel PC:
The data recorded by hand on paper will be used to calculate for a limited time the mass of methane. Any failure of panel PC will be recorded immediately after discovery in the plant operation journal.

d) Documentation on the accuracy of monitored data:

1-3) Flow meters:
Diagram of accuracy by the manufacturer
Regulation of the manufacturer for service and range of the calibration

4) Left blank on purpose

5) Effectiveness of the flare:
Statement of accuracy by the manufacturer

6) Methane analyser:
Statement of accuracy by the manufacturer
Regulation of the manufacturer for service and range of the calibration

7-8) Temperature and pressure sensors:
Diagram of accuracy by the manufacturer
Regulation of the manufacturer for service and range of the calibration

9 and 12) Electric meter
Accuracy supervised by the grid authority

10 and 11) Official sources

13) Official sources

14a b c d) According 1-3 and 6

e) Comment on difficulties of understanding the methodology

Concerning accuracy of the methane analyser:

The methodology asks for an accuracy of the methane analyser of at least 95%. The author of the monitoring plan assumes that in case the manufacturer states a higher accuracy than 95% and regular calibration is performed according to the requirements of the manufacturer that the resulting data of the gas analyser can be taken fully into account for the calculation of the methane concentration of the landfill gas. Therefore any deductions for conservativeness of the data of the gas analyser are not necessary as the methodology's demands for accuracy are fulfilled.

Technical explanation:

Due to accuracy of the pumps within the gas analyser a technically given inaccuracy will take place in all currently available types of suitable gas analysers for landfill gas. Further it is necessary to state that it is very difficult to get gases for calibrations that have a 100% purity. Better results are only possible under laboratory conditions using mass-spectrometers and special calibration gases for laboratory usage. Regular tests with this technology would cause high costs that would not be justified by the limited gain of accuracy.

Concerning measurement of flare efficiency:

- The producer of the flare guarantees an efficiency of the combustion of more than 99%.(see Annex 6.1), therefore it is impossible that the methane concentration in the exhaust could be higher than 1%.
- Physically, the concentration of methane in the exhaust of the flare can only reach up to 0,1% of the gas volume. This is especially the case when enclosed high temperature flares are being used with guaranteed retention time above 0,3 seconds and temperatures above 1000 C^0.
- Due to the high temperature in the flare, the eventually remaining methane is likely to be transformed into other hydrocarbons than methane, so it is not realistic to look for methane in the exhaust.
- <u>There are no international norms how to perform a direct measurement of flare efficiency</u>. Therefore there are no regulations where the measurement of the remaining methane should be taken. In case there are other influences like strong winds during the measurement, the possible results will vary.
- To get conservative values for flare efficiency , the authors propose to use the efficiency as stated by the manufacturer of the flare in Annex 6.1.

<u>Annex 5</u>

VERIFICATION

The Verifier has to check the following items:

Consistency of Data:

- The data from the plant operations journal have to be consistent with the electronic data.
- The plant operator has to prepare information in advance how eventual inconsistencies have been caused.
- The protocol of any failure of a monitoring device has to be consistent and missing data conservatively replaced.

Data to be measured and calculated by the plant operator for annual verification:

- Overall volume of landfill gas extracted
- Methane in tons that has been extracted
- Volume of landfill gas combusted in the flare
- Volume of landfill gas combusted in the engine
- Electric power exported to the grid
- Electric power imported from the grid
- CO_2 in tons that has been replaced by exporting power to the grid according to the baseline

For the control of this data the operator has to provide following documents/data:

- Plant Operations Journal
- Monthly Report on the data from the plant operations journal
- Electronic file with all recorded data
- Documents on the calibration of the meters and accuracy by the manufacturer of the meters
- Documents/protocols on any service or repair of the meters
- Bills /Documents on power delivery to the grid
- Statement on the influence of the plant on bird life and eventual precautions that have been taken to prevent the death of birds due to the plant operation.

In addition the following items have to be checked:

- Regular payment to the employees according to the regulations in Israel
- Information on medical control or suitable immunization of plant employees

Annex 6

Technical Data

6.1 Data on Flare Efficiency

BIOTECNOGAS

	FLARE BTG 1000 HT	JOB N°	BTG010-02-C
PURCHASER	B.O.T. ENVIRONMENT LTD	DATE	05/09/2005

LFG CHARACTERISTICS

Component	Formula	Unit	Normal	Fluctuation
Methane	CH_4	% vol.	50	30/60
Carbon dioxide	CO_2	% vol.	40	30/45
Oxygen	O_2	% vol.	2	0/6
Nitrogen	N_2	% vol.	7	0/10
Steam	H_2O	% vol.	1	0/5
Hydrogen	H_2	ppm	-	-
Sulphuric acid	H_2S	ppm	-	traces
Ammonia	NH_3	ppm	-	traces

OPERATIONAL CONDITIONS

	Unit	Normal	Fluctuation
Volumetric flow (1 bar, 0°C)	Nm^3/h	1.000	200/1.000
Massive flow	kg/h	1.220	244/1.220
Thermic power	kW	5.000	1.000/5.000

INLET CONDITIONS

	Unit	Normal	Fluctuation
Inlet pressure	mbar	50	20/70
Inlet temperature	°C	45	5/45
Inlet density	kg/Nm^3	1,22	0,90/1,3

FUNCTIONING CONDITIONS

	Unit	Normal	Fluctuation
Combustion temperature	°C	1.100	1.000/1.200
Flame time	s	>0,5	-
Excess of oxygen	% vol.	>6	-
Combustion efficiency ($CO_2/CO+CO_2$)	%	>99	-

BIOTECNOGAS s.r.l

Sede Operativa ed Amministrativa
Via [illegible], 10
20090 - Assago - MILANO
Tel. +39 02 45784048
02 45707596
Fax +39 02 45705227

Sede Legale
Viale Cirene, 7
20135 - MILANO
P. IVA, C.F. e Reg. Imprese Milano

File: BTG 528

actualización: Mayo 2005

elaborado por:
visado por:
aprovado por:

pag. 1 of 2

DATA SHEET
DS 100 -HT -GB

6.2 Volume Meter
(supplied later)

6.3 Methane Analyzer
(SUPPLIED LATER)

- - - - -