

5. POLLUTION CONTROL, MONITORING AND REPORTING

5.1 Introduction

All existing gas, groundwater, surface water and leachate monitoring points are shown on Drawing No.s 4 to 7. In summary they consist of:

- Eight subsurface landfill gas monitoring points.
- Two leachate monitoring points, one of which is representative of the waste mass
- Six surface water sampling points
- Eight groundwater monitoring boreholes installations
- Fifty-two gas extractions wells with raw landfill gas (RLFG) monitoring capacity.
- Two high temperature RLFG enclosed flare stacks with the capacity to monitor input gas.

Hydrogen sulphide air quality monitoring (this is an agreed two year study which commenced in February 2000 (and will be reviewed in April 2002), as shown on Drawing No 13), takes place as follows:

- One Jerome 631-X hydrogen sulphide monitor is placed at each of eight boundary stations on the landfill site, for a period of three months at a time, as agreed with the Agency.
- There are three community H₂S monitoring stations. An H₂S monitor is placed at each agreed community monitoring station for a period of 3 months at a time. Ideally the community monitoring location should correspond to that of the site boundary location (i.e. H₂S monitors geographically aligned with prevailing wind direction). This exercise is rotated to the next location for the same length of time.

- One hand held monitor is used as a back up to the monitors described above, for ambient H₂S investigation, walkover surveys and spot checks, both on and off the site.

Amgen Rhondda Ltd will forward a quarterly report to the Environment Agency detailing all of the air quality monitoring undertaken at the site. The report will include a review of the monitoring data against relevant standards and against Site specific background values and make recommendations for action where required.

5.2 Monitoring and Balancing of Landfill Gas Extraction System

5.2.1 Provision of Landfill Gas Monitoring System

Gas control in phase I of the landfill is provided by the two engineered systems. Control is provided by progressively capping the completed landfill cells as soon as practicable with an engineered low permeability gas barrier and by the operation of an active gas management system comprising of gas collection and flare, as detailed in Section 2 of this Working Plan.

Gas control in phase II of the landfill will be similar to that discussed above with the exception of the active gas management system being implemented once presettlement / precapping levels have been achieved within the respective cell.

5.2.2 Design Report on Gas Extraction Monitoring Installation

A written design report detailing the proposed system for respective phase/cell will be forwarded to the agency prior to the installation of landfill gas extraction monitoring points (i.e. gas wells). Following

acknowledgement from the agency this report shall be incorporated into the working plan and consist of the following details:

- Description, including design specification, scale drawings and location plans of monitoring points
- Description of how the monitoring points will be operated and maintained
- A CQA plan and validation report shall be included as part of the design report

5.2.3 Design and operational standards for landfill gas extraction monitoring system

Landfill gas extraction monitoring systems will be provided for each respective new stage of landfilling. Gas well installation will meet the following criteria:

- Individual gas extraction wells will have at least one monitoring point, permitting a representative sample of RLFG to be taken at any time
- Individual gas extraction installation within the boundary of the completed cell shall be secured and protected from damage and vandalism.
- The installations shall be inspected for defects/damage on a daily basis. Upon identification these will be noted and remedial measures undertaken as soon as possible and in any case within 48 hours
- A record of remedial actions undertaken shall be recorded in the site diary.

5.2.4 Landfill Gas Monitoring Programme

Monitoring of RLFG within the extraction system in each cell or phase shall be carried out in accordance with the standards set out in table 6.

Table 6 Schedule for Internal Landfill Gas Monitoring.

Determinands	Monitoring Frequencies	Units and Accuracy	Trigger Levels
Methane (CH₄)	Fortnightly on commissioning of the extraction system	% -Within operating parameters of GI's GA 2000 gas analyser	<20%
Carbon Dioxide	Fortnightly on commissioning of the extraction system	% -Within operating parameters of GI's GA 2000 gas analyser	N/A
Oxygen	Fortnightly on commissioning of the extraction system	% -Within operating parameters of GI's GA 2000 gas analyser	>5%
Temperature	Fortnightly on commissioning of the extraction system	+/- 0.5°C	None
Differential pressure	Fortnightly on commissioning of the extraction system	mbar	None
RLFG Composition	Annually, simultaneous with table 6.	µg/kg, or % concentration	None

Including trace components of RLFG from the extraction prior to the disposal system.

In the event that any of the results of the RLFG landfill gas extraction system exceed the relevant trigger levels specified in table 6, immediate action shall be administered to balance the system in order to ensure that the measured values are maintained below the specified trigger levels.

5.3 Monitoring and Reporting of emissions from Landfill Gas Flares

5.3.1 Quality assurance plan for monitoring of flare emissions

Prior to commissioning and operation of a landfill gas flare for a cell or phase, the Agency will be forwarded in writing a quality assurance

plan for the monitoring of emissions from the flare, which is detailed as follows:

- Monitoring shall only be undertaken by suitably competent/qualified staff
- Monitoring equipment shall be calibrated and serviced in accordance with the manufacturer recommendations.
- A representative sample of emission gasses will be collected annually from the flare stack, and will be analysed in an accredited laboratory using gas chromatography or suitable alternative methodology.
- Records shall include determinants sampled/monitored, dates, times, locations, personnel etc.
- Results of measurements and error limits
- Validation of accuracy and validity of results
- Quality assured records shall be submitted to the Agency.

5.3.2 Emission monitoring and sampling programme

Upon commissioning of a landfill gas flare for a cell or phase, within the first 6 months of commissioning and from then on an annual basis. Monitoring of emissions from the flare shall be undertaken to measure and record the determinants specified in table 6 . These results will be undertaken in accordance with the quality assurance plan.

Table 7 Landfill flare emissions monitoring programme – Standards and determinands.

Emission monitoring determinands	Monitoring Frequencies	Units and Accuracy	Trigger Levels
Unburned Hydrocarbons	Annually	Mg/Nm ³ , 1 Mg/Nm ³	< 10 Mg/Nm ³
Oxides of Nitrogen (NO_x)	Annually	Mg/Nm ³ , 1 Mg/Nm ³	< 150 Mg/Nm ³
Carbon Monoxide (CO)	Annually	Mg/Nm ³ , 1 Mg/Nm ³	< 150 Mg/Nm ³
Temperature	Continuous	°C, 0.5 °C	≥ 1000 °C
Retention Time	Annually	Seconds, 0.005 s	> 0.3 Seconds
Gas flow Rate	Continuous	M ³ /hr, 0.5 M ³ /hr	Minimum level Recommended in the relevant design specification
Hydrogen Sulphide (H₂S)	Annually	Mg/Nm ³ , 1 Mg/Nm ³	To be agreed
Sulphur Dioxide (SO₂)	Annually	Mg/Nm ³ , 1 Mg/Nm ³	To be agreed
Trace and Novel compounds	Annually	Mg/Nm ³ , 1 Mg/Nm ³	None
Hydrogen Fluoride (HF)	Annually	Mg/Nm ³ , 1 Mg/Nm ³	None
Hydrogen Chloride (HCl)	Annually	Mg/Nm ³ , 1 Mg/Nm ³	None
Input RLFG – Oxygen	Continuous	%, +/- 1%	<5%
Input RLFG – Methane	Continuous	%, +/- 1%	>20%
Flare Failure	Continuous	N/A	Per occurrence

Note: Both Oxygen and methane are constantly displayed but are only noted once per day for purposes of record keeping.

5.3.3 Emissions monitoring action plan.

In the event that any results exceed the respective trigger levels specified in Table 7 above, the results shall be forwarded to the Agency and the action plan shall be implemented, this shall consist of the following:

- The contractor/laboratory appointed that carried out the emissions monitoring shall be contacted to re-verify the results.
- Should the results from the stack prove to be above trigger levels, the stack shall be re-tested if necessary, to validate the

contractor/laboratory results. The re-testing shall occur within 6 weeks of the initial monitoring.

- In the event that the re-verified results are substantiated and correct the flare service and maintenance contractor shall be duly notified to carry out any works that may rectify the situation. At this point the flare service and maintenance contractor shall monitor the stack on the completion of his work.

5.4 Monitoring and control of landfill gas utilisation systems and alternative methods of disposal

A quality assurance plan and programme to monitor and control emissions against specified limits shall be submitted to the Agency. Prior to the commissioning of this apparatus on approval this shall be incorporated within the working plan.

5.5 Landfill gas monitoring and reporting external to the waste

5.5.1 Provision of external landfill gas monitoring system

Monitoring of landfill gas concentrations off-site is currently undertaken from the 8 dedicated perimeter gas wells, as shown on drawing No 7. The objective of the external landfill gas monitoring system is to enable monitoring of the gases in the ground outside the waste body, to determine whether landfill gas is migrating from the site.

5.5.2 Design report on external landfill gas monitoring system

Prior to the installation of any new external landfill gas monitoring systems Amgen Rhondda Ltd will provide the agency with a written document providing the information detailed below:

- Description, including design specification, scale drawings and location plans, for any landfill gas monitoring boreholes which are to be provided outside the waste body.
- Description of how the external landfill gas management system will be operated and maintained.
- On the acceptance of this by the Agency the approved report shall be incorporated into the working plan.

5.5.3 Design and operational standards for external landfill gas monitoring system

Prior to the installation of any new external landfill gas monitoring systems the system shall be designed, constructed, inspected, maintained, documented and recorded to meet the following:

- The location, spacing and depth of any new boreholes shall be approved in a specified report.
- All new installations shall consist of boreholes of a minimum diameter of 150mm, containing a rigid HDPE casing of minimum diameter of 50mm. The annulus of the borehole shall be packed with non-calcareous pea gravel, and completed at the surface with a gas tight seal. The borehole casing shall consist of a manufactured slotted pipe within the response zone of the borehole and plain pipe through the gas tight seal. The borehole casing shall be completed at the surface with a removable gas tap, suitable for sampling, and these head works shall be protected from damage.

During construction of the boreholes, a record shall be made of the subsurface geology encountered during drilling.

The geology found shall be described by an appropriately qualified geotechnical engineer or similar person, who shall provide a record of the 'as built' dimensions of the monitoring installation.

- The boreholes shall be inspected by Amgen Rhondda Ltd for defects and damage during each routine monitoring exercise. Defects shall be noted and recorded in the site diary, remedial repairs will be undertaken ASAP.
- An annual review of the system shall be undertaken, to ensure that the system is meeting its design performance.
- A written report of the review shall be submitted to the Agency.

5.5.4 External landfill gas monitoring and sampling programme

Monitoring and sampling of landfill gas external to the waste body, shall be undertaken in accordance with the standards specified in table 8 below :-

Table 8: Standards for External landfill gas monitoring and sampling programme

Determinands	Monitoring Frequencies	Units and Accuracies	Trigger Levels
Methane (CH₄)	Monthly	% v/v and 0.1%	> 1%
Carbon Dioxide	Monthly	% v/v and 0.1%	> 1.5% above baseline levels
Oxygen	Monthly	% v/v and 0.1%	<18%
Hydrogen Sulphide	Monthly	% v/v and 0.1%	None
Carbon Monoxide	Monthly	% v/v and 0.1%	None
Atmospheric Pressure	Monthly	Mbar, to 1 Mbar	None
Differential pressure	Monthly	Mbar, to 1 Mbar	None
Temperature	Monthly	°C , to 1 °C	None

5.5.5 Baseline monitoring results

Prior to the placement of waste in phase 2 a minimum of 12 sets of gas monitoring results will be compiled and forwarded to the Agency to determine a baseline/background level of RLFG.

5.5.6 Monitoring and sampling results.

A record of the external landfill gas monitoring results shall be made by Amgen Rhondda Ltd and submitted to the Agency in accordance with the following:

- Monitoring of external landfill gas is only undertaken by suitably competent/qualified staff. (Appendix 15)
- Monitoring equipment shall be calibrated and serviced in accordance with the manufactures recommendations.
- Records shall include the determinands monitored, dates times, locations, and personnel undertaking the monitoring.
- Results of measurements with error limits.
- Interpretation and review of results against trigger levels.
- A copy of the results shall be forwarded to the agency within 1 month of the monitoring being undertaken.

5.5.7 Emissions monitoring action plan.

In the event that a trigger level of external landfill gas is breached then the following protocol will be actioned:

- Notify the Agency immediately
- Check whether the barometric pressure was rising, falling or steady on the day and in the day(s) preceding the date of monitoring;
- Check the results against those of other site monitoring boreholes to determine if the result is part of a general deterioration in gas levels in the area, or a localised occurrence;
- Check oxygen and carbon dioxide levels to determine if these correlate to deterioration in gas concentrations;
- Ensure that monitoring equipment is functioning effectively;

- Attempt to identify most likely source of methane, in relationship to the history of landfill at the site, and the past monitoring results;
- Investigate the surrounding area for signs of gas or leachate escape;
- If a problem is identified, it will be rectified immediately if possible. The Site Manager will be informed immediately and will co-ordinate any required action;
- Record all actions in the Site Diary.
- If the problem persists then specialist advice will be sought and appropriate measures will be carried out as agreed with the Agency.

5.6 Perimeter and surface monitoring of Hydrogen Sulphide within the licensed area

5.6.1 Provision of Hydrogen Sulphide monitoring system

Since February 2000 Amgen Rhondda Ltd has operated a Hydrogen Sulphide monitoring and reporting programme. This is an initial 2-year commitment, subject to review in March 2002 by the Air quality Monitoring Forum, consisting of: Amgen Rhondda Ltd, Rhondda Cynon Taff - Environmental Health Department and the Environment Agency.

Nant-y-Gwyddon landfill site has 3 No. Jerome 631-X H₂S monitors, of which 2 are used to monitor H₂S within the licensed area. One Jerome 631-X H₂S monitor is placed in one of the eight permanent site boundary kiosks for an agreed period (with Agency), usually 3 calendar months – this is in alignment with one of the 3 community H₂S monitoring stations. The other monitor is used for weekly walkover H₂S surveys of the site in order to assess potential H₂S emissions from the landfill. Drawing 13 denotes the locations of the eight fixed

perimeter points. Drawing 14 denotes the walkover monitoring locations.

5.6.2 Hydrogen Sulphide monitoring and sampling programme

Amgen Rhondda Ltd currently operates its Hydrogen Sulphide monitoring programme as agreed with the Agency. This will be reviewed in April 2002. (Appendix 13)

5.6.3 Monitoring and sampling records

A record of all Hydrogen Sulphide monitoring and sampling results shall be made and submitted to the Agency in a quarterly report and will include the following requirements:

- Monitoring and sampling methodologies followed as agreed in prior discussion with the Agency.
- Monitoring and sampling will be undertaken by competent personnel .
- Sampling records shall consist of the following details; dates, times, locations etc
- Results shall be provided with error limits
- Accuracy of monitors shall be validated by the provision of calibration certification
- Quarterly reports will be submitted to the agency at the end of each monitoring phase, supported with results, tables and other analysis in an electronic format as agreed with the Agency.

5.6.4 Hydrogen Sulphide monitoring action plan

In the event that boundary or community monitoring of Hydrogen Sulphide values exceed the trigger of 10ppb (parts per billion), the results shall immediately be notified to the Agency and confirmed in

writing. The Landfill gas action plan, as specified in s.5.5.7 of the Working Plan shall then be implemented.

5.7 Community Hydrogen Sulphide monitoring procedures

5.7.1 Provision of Hydrogen sulphide community monitoring system

Amgen Rhondda Ltd currently utilises 3 No. community Hydrogen sulphide monitoring sites which are located within the local communities of Gelli, Blaenclydach and Clydach Vale.

These sites are of a fixed and permanent nature, the exact locations of which have been agreed beforehand with the Agency. A Jerome 631-X H₂S monitor is housed in one of the above community sites, to which the site boundary monitor is aligned to for an agreed period of 3 calendar months. Monitoring and reporting procedures are as described in sections 5.6.2, 5.6.3 and 5.6.4 above.

5.8 Weather Monitoring

5.8.1 Provision of Weather Monitoring System

A Davis meteorological station is located at the site office, as shown on Drawing 2. The weather station records, displays and monitors meteorological information on a continuous basis and has the facility of a remote display feature within the weighbridge office.

5.8.2 Weather monitoring and recording programme

The meteorological information is collected from the weather station and downloaded to the adjoining P.C. at 30 minute intervals in accordance with the minimum requirements of table 9 overleaf :-

Table 9: Meteorological Parameters

Determinands	Monitoring Frequencies	Units and Accuracies	Trigger Levels
Wind Speed	Continuous	Km/hr or MPH	50 MPH
Wind Direction	Continuous	Compass bearing	None
Relative Humidity	Continuous	%	None
Temperature	Continuous	⁰ C	<0 ⁰ C
Rain Fall	Continuous	Mm/hr	None
Atmospheric Pressure	Continuous	mbar	None

The meteorological monitoring shall be undertaken in accordance with the method statements given in Appendix 6.

A record of the weather monitoring results shall be made and submitted to the Agency at the end of every calendar month in both hard copy and an electronic version.

5.8.3 Weather monitoring action plan

In the event that the wind speed rises above the trigger level of 50 mph or temperature falls below -5⁰C then the results shall be notified to the Agency immediately, and an agreed procedure invoked with regard to site operations. (i.e. temporary cessation of tipping / additional litter control measures etc.)

5.9 Leachate Monitoring and Reporting

5.9.1 Leachate monitoring and sampling system

Leachate monitoring and sampling is undertaken from the locations shown on Drawing 4. Currently leachate sampling and monitoring is undertaken from MH L2a (Manhole upstream of the holding tank) and from MH L5a, an inspection chamber situated within the waste mass of phase 1. These sampling locations have been deemed safe in order

to obtain a representative leachate sample from and pose little threat from the exposure of RLFG.

The head of leachate upon the liner of phase one shall be gauged with the dip measurement of the following manhole installations; MH S7, MH L11, MH L14 and MH L18 all of which are located within the waste mass of cell 1. The elevation of these monitoring points are referenced to Ordnance datum and are re-levelled if damaged, altered or raised etc. New levels shall be forwarded to the Agency in writing at the earliest opportunity.

5.9.2 Leachate monitoring and sampling programme

Leachate monitoring and sampling will be undertaken by Amgen Rhondda Ltd, on a monthly and quarterly time frequency, and shall consist of the following determinands as shown in table 10 below and overleaf :-

Table 10: Leachate monitoring and sampling determinands:

Parameter	Monthly Suite	Quarterly Suite	Annual Suite	Lower Detection Limit mg/l	Action Threshold
1,2-Dichloroethane		✓	✓	0.002	
Acetone			✓	0.1	
Acrylonitrile			✓	0.1	
Alkalinity	✓	✓	✓	10	
Ammoniacal Nitrogen	✓	✓	✓	0.3	
Arsenic			✓	0.0005	
Benzene		✓	✓	0.002	
BOD	✓	✓	✓	1.3	
Cadmium		✓	✓	0.0002	
Calcium		✓	✓	0.01	
Chloride	✓	✓	✓	20	
Chromium		✓	✓	0.01	
COD	✓	✓	✓	17	
Conductivity	✓	✓	✓		
Copper		✓	✓	0.01	
Anionic Detergents and Surfactants			✓	0.2	
Dimethoxymethane			✓	0.1	
Dimethylethanolamine			✓	0.01	
Dissolved Oxygen				0.5	
Formaldehyde			✓	0.1	
Iron		✓	✓	0.01	
Lead		✓	✓		
Magnesium		✓	✓	0.0005	
Manganese			✓	0.001	
Mercury			✓	0.0005	
Methanol			✓		
Nickel		✓	✓	0.01	
Nitrate		✓	✓	0.4	
Nitrite		✓	✓	0.008	
pH	✓	✓	✓	n/a	
Phenol		✓	✓	0.11	
Phosphate		✓	✓	0.1	
Potassium		✓	✓	0.0005	
Propan-1-ol			✓	0.1	
Propan-2-ol			✓	0.1	
Propylamine			✓	0.01	
Sodium		✓	✓	0.0005	
Sulphate		✓	✓	0.1	
Sulphide		✓	✓	0.2	
Suspended Solids	✓	✓	✓	2	
Styrene		✓	✓	0.002	
Temperature	✓	✓	✓		
TOC	✓	✓	✓	2	
Toluene			✓	0.002	
Total Oxidised Nitrogen		✓	✓	0.4	
Trichloroethane		✓	✓	0.002	
Trichloroethylene		✓	✓	0.002	
Trimethylamine			✓	0.01	
Water/leachate level / piezometric head	✓	✓	✓	n/a	
Xylene		✓	✓	0.002	
Zinc		✓	✓	0.05	

5.9.3 Leachate sampling and monitoring records

A record of the leachate monitoring and sampling results shall be made after each exercise and submitted to the Agency in accordance with the following requirements:

- The environmental monitoring procedure (Appendix 9).
- Analytical methodologies and laboratory competence or accreditation
- The records shall also include determinands monitored, details of measurements, dates, times, observations etc.
- Results with error limits.
- Validation of accuracy of results and monitoring equipment.
- A copy of the quality assured results shall be forwarded to the Agency upon the completion and validation of each monitoring exercise, in a format agreed with the Agency.

5.9.4 Leachate Generation action plan

In the event that the leachate head recorded in MH S7, MH L11, MH L14 and MH L18 is greater than the permissible trigger level of 1m above the basal liner, then the results shall be notified to the Agency and the leachate action plan shall be implemented immediately.

The leachate action plan shall consist of the following:

- In the first instance Amgen Rhondda Ltd will, review all respective data. In order to ascertain, whether or not the installation is under the influence of perched water levels within the waste mass.
- If the situation presents itself, i.e. the review of the primary data is inconclusive, all installations shall be revisited and monitored, in order to calculate the leachate head.

- After the review of primary and secondary monitoring data, if this proves to be inconclusive, and the leachate head is still in excess of the permitted 1m above the basal liner, then specialist advice will be sought to investigate and rectify the situation.

5.10 Groundwater monitoring and reporting system

5.10.1 Provision of engineered groundwater monitoring system

Currently Amgen Rhondda Ltd employs the use of 8 No. groundwater monitoring installations at the Nant-y-Gwyddon landfill site. These are positioned in a radial order outside of the wastemass at varying depths to assess the ongoing quality of the groundwater. (As shown on drawing 5)

5.10.2 The engineered external groundwater monitoring system.

At present Amgen Rhondda Ltd operates a groundwater monitoring system that has already been constructed, the details and records of which are described in section 2 (site engineering for pollution prevention control)

Following the completion of a Regulation 15 assessment, extra groundwater monitoring installations may be required by the Agency. New groundwater monitoring installations will be constructed and quality assured in accordance with the guidance outlined in Waste Management Paper 4. The location, spacing, depth and design shall be forwarded to the Agency for their approval prior to commissioning.

Visual inspection of groundwater monitoring points will be made at each monitoring visit and Amgen Rhondda Ltd, prior to the next cycle of monitoring will rectify any defects found.

5.10.3 Groundwater monitoring and sampling program

Groundwater monitoring and sampling will be undertaken by Amgen Rhondda Ltd, on a monthly and quarterly time frequency, and shall consist of the following determinands as shown in table 11 below and overleaf :-

Table 11 Groundwater monitoring and sampling determinands:

Parameter	MONTHLY Suite	Quarterly Suite	Annual Suite	Lower Detection Limit mg/l	Action Threshold
1,2-Dichloroethane		✓	✓	0.002	
Acetone			✓	0.1	
Acrylonitrile			✓	0.1	
Alkalinity	✓	✓	✓	10	
Ammoniacal Nitrogen	✓	✓	✓	0.3	
Arsenic			✓	0.0005	
Benzene		✓	✓	0.002	
BOD	✓	✓	✓	1.3	
Cadmium		✓	✓	0.0002	
Calcium		✓	✓	0.01	
Chloride	✓	✓	✓	20	
Chromium		✓	✓	0.01	
COD	✓	✓	✓	17	
Conductivity	✓	✓	✓	100 uS	
Copper		✓	✓	0.01	
Anionic Detergents and Surfactants			✓	0.2	
Dimethoxymethane			✓	0.1	
Dimethylethanolamine			✓	0.01	
Dissolved Oxygen				0.5	
Formaldehyde			✓	0.1	
Iron		✓	✓	0.01	
Lead		✓	✓		
Magnesium		✓	✓	0.0005	
Manganese			✓	0.001	
Mercury			✓	0.0005	
Methanol			✓		
Nickel		✓	✓	0.01	
Nitrate	✓	✓	✓	0.4	
Nitrite	✓	✓	✓	0.008	
pH	✓	✓	✓	n/a	
Phenol		✓	✓	0.11	
Phosphate		✓	✓	0.1	
Potassium		✓	✓	0.0005	
Propan-1-ol			✓	0.1	
Propan-2-ol			✓	0.1	
Propylamine			✓	0.01	
Sodium		✓	✓	0.0005	
Sulphate		✓	✓	0.1	
Sulphide		✓	✓	0.2	
Suspended Solids	✓	✓	✓	2	
Styrene		✓	✓	0.002	
Temperature	✓	✓	✓	0.1 C	
TOC	✓	✓	✓	2	
Toluene		✓	✓	0.002	
Total Oxidised Nitrogen		✓	✓	0.4	
Trichloroethane		✓	✓	0.002	
Trichloroethylene		✓	✓	0.002	
Trimethylamine			✓	0.01	
Water/leachate level / piezometric head	✓	✓	✓	n/a	
Xylene		✓	✓	0.002	
Zinc		✓	✓	0.05	

5.10.4 Groundwater monitoring and sampling records.

A record of the groundwater monitoring and sampling results shall be made and submitted to the agency in an agreed format, in accordance with the following:

- Monitoring and sampling methodologies as described in appendix 6.
- Analytical methodologies and laboratory accreditation
- Monitoring and sampling will be carried out by competently trained staff
- The records shall include determinands monitored, specified details of measurements e.g. date, time, condition of installation and other relevant parameters.
- Results of measurements with error limits
- Validation of accuracy of monitoring equipment.
- A copy of quality assured records shall be forwarded to the agency at the end of each monitoring exercise.

5.10.5 Groundwater monitoring action plan.

In the event of any results that exceed the trigger level as specified after 12 months of monitoring, the agency shall be notified immediately and this confirmed in writing. A groundwater action plan shall then be implemented as described overleaf;

5.10.6 Investigation Procedure and Follow-up Action

In the event that concentrations are significantly elevated above background, the following action will be taken:

- a) the borehole will be re-sampled and the sample analysed for major cations and anions. Results of the second analysis will be

obtained as soon as possible and in any case within three weeks.

The results of the re-sampling will be forwarded to the Agency;

- b) if the second analysis also shows concentrations significantly elevated above background then data from the borehole and adjacent boreholes will be reviewed by use of statistics and graphical presentation to establish the presence of any trends or patterns;
- c) groundwater levels will be reviewed to establish flow direction in order to determine whether the landfill is the most likely cause of any change in groundwater quality;
- d) a preliminary inspection will be carried out to determine whether there has been any unusual activity or occurrence on the site that could account for the increase in concentration.
- e) Amgen Rhondda will assess all the above information and will liaise with the Environment Agency to determine a further course of action.

5.10.7 Reference elevation for groundwater monitoring point.

All groundwater monitoring installations will be surveyed and referenced to O.D. levels. In the event of new groundwater monitoring boreholes they to will be referenced to O.D. level at the time of the next appropriate survey exercise.

In the event that the reference elevation mark has changed as result of damage, extension or movement, the installation shall be re-levelled at the next site survey date. The agency shall be informed in writing of the reference elevation and locations of all groundwater monitoring points and any subsequent changes.

5.11 Surface Water monitoring and reporting

5.11.1 Provision of surface water monitoring systems.

Amgen Rhondda Ltd currently operates a surface water quality monitoring system. Included in this are 6 surface monitoring locations that are thought to be most representative of the local tributaries (to the Avon Rhondda Fawr) around the landfill site. These surface water monitoring points are shown on Drawing No 6, and are listed in Table 12 below. These locations have been previously agreed with the Agency.

5.11.2 Surface water discharge from surface water settlement lagoons.

Surface water generated on site is directed to three surface water settlement lagoons, for the purpose of attenuating flows and reducing levels of suspended solids prior to discharging to the Nant-y-Gwyddon tributary. This operation has been agreed with the Agency pending formal discharge consents. Interim surface water discharge guidance is as follows;

- Total ammonia levels not to exceed 1mg/l
- Suspended solid levels not exceed 60 mg/l
- Dissolved Oxygen level not to be less than 5mg/l

5.11.3 Surface water monitoring and sampling program.

Surface water monitoring and sampling will be undertaken by Amgen Rhondda Ltd, on a monthly and quarterly time frequency, and shall consist of the following determinands as shown in table 12 below and overleaf:-

Table 12: Surface water monitoring and sampling determinands:

Parameter	Monthly Suite	Quarterly Suite	Annual Suite	Lower Detection Limit mg/l	Action Threshold
1,2-Dichloroethane		✓	✓	0.002	
Acetone			✓	0.1	
Acrylonitrile			✓	0.1	
Alkalinity	✓	✓	✓	10	
Ammoniacal Nitrogen	✓	✓	✓	0.3	
Arsenic			✓	0.0005	
Benzene			✓	0.002	
BOD	✓	✓	✓	1.3	
Cadmium		✓	✓	0.0002	
Calcium		✓	✓	0.01	
Chloride	✓	✓	✓	20	
Chromium		✓	✓	0.01	
COD	✓	✓	✓	17	
Conductivity	✓	✓	✓	100 uS	
Copper		✓	✓	0.01	
Anionic Detergents and Surfactants			✓	0.2	
Dimethoxymethane			✓	0.1	
Dimethylethanolamine			✓	0.01	
Dissolved Oxygen	✓	✓	✓	0.5	
Formaldehyde			✓	0.1	
Iron		✓	✓	0.01	
Lead		✓	✓		
Magnesium		✓	✓	0.0005	
Manganese			✓	0.001	
Mercury			✓	0.0005	
Methanol			✓		
Nickel		✓	✓	0.01	
Nitrate		✓	✓	0.4	
Nitrite		✓	✓	0.008	
pH	✓	✓	✓	n/a	
Phenol			✓	0.11	
Phosphate		✓	✓	0.1	
Potassium		✓	✓	0.0005	
Propan-1-ol			✓	0.1	
Propan-2-ol			✓	0.1	
Propylamine			✓	0.01	
Sodium		✓	✓	0.0005	
Sulphate		✓	✓	0.1	
Sulphide		✓	✓	0.2	
Suspended Solids	✓	✓	✓	2	
Styrene			✓	0.002	
Temperature	✓	✓	✓	0.1 C	
TOC	✓	✓	✓	2	
Toluene			✓	0.002	
Total Oxidised Nitrogen			✓	0.4	
Trichloroethane			✓	0.002	
Trichloroethylene			✓	0.002	
Trimethylamine			✓	0.01	
Water/leachate level / piezometric head				n/a	
Xylene			✓	0.002	
Zinc		✓	✓	0.05	

5.11.4 Surface water monitoring and sampling records.

Surface water monitoring and sampling results for the Nant-y-Gwyddon landfill site shall be made and submitted to the agency in accordance with the following;

- Monitoring and sampling methodologies, as described in appendix 9.
- Analytical methodologies and laboratory accreditation
- Monitoring and sampling will be carried out by competently trained staff
- The records shall include determinands monitored, specified details of measurements e.g. date, time, condition of installation and other relevant parameters.
- Results of measurements with error limits
- Validation of accuracy of monitoring equipment.
- A copy of quality assured records shall be forwarded to the agency at the end of each monitoring exercise.

5.11.5 Surface water monitoring action plan.

In the event that concentrations are significantly elevated above background, i.e. after 12 months monitoring so that background and trigger levels can be set, the following action will be taken:

- a) the surface water course will be re-sampled and the sample analysed for any known leachate contaminants. Results of the second analysis will be obtained as soon as possible and in any case within two weeks. The results of the re-sampling will be forwarded to the Agency;
- b) if the second analysis also shows concentrations significantly elevated above background, then data from the surface water

course and groundwater monitoring boreholes will be reviewed by use of statistics and graphical presentation to establish the presence of any trends or patterns;

- c) a preliminary inspection will be carried out to determine whether there has been any unusual activity or occurrence on the site that could account for the increase in concentration.
- d) Amgen Rhondda will assess all the above information and will liaise with the Environment Agency to determine a further course of action.

Footnote: It is Amgen Rhondda Ltd policy to separate out (as far as practicably possible) surface water and contaminated water systems. Should any watercourse be considered contaminated, all reasonable attempts to the satisfaction of the Agency will be made to isolate the source.