

**Date: 08 Jan 2013 & Updated 09 Oct 2013**

**Rhodia UK Ltd**

**Landfill PPC Permit: EP 3839 PZ**

The following comments are made in respect of the suitability of several documents that may comprise the closure plan for the above site. The comments are limited to the operational work area of the Groundwater and Contaminated Land Team.

## **1.0 Groundwater Monitoring**

The following documents have been considered;

- Hydrogeological Risk Assessment (ref: UK/EP 3839 PZ/B1.4.1)
- ESID Report (ref: UK/EP 3839 PZ/B1.3.1)

**NB.** Notes in Blue summarise the agreed actions arising from a meeting with the Company and URS Consultants on the 08/03/2013.

**Review comments 09/10/2013 added in dark blue at the end of each Section.**

### **1.1 Frequency;**

Based on a conservative estimate (**ref 1**) utilising appropriate parameters from the HRA report, travel time to a theoretical 50 metre compliance point would be greater than 2 years. Therefore, minimum monitoring frequency stated in Tables 6.8 and 6.9 (**ref 1**) are appropriate. Groundwater level monitoring should be undertaken at a minimum frequency of 6 monthly (2 x year) and groundwater quality monitoring at a frequency based on the “possibility of remedial action between two samples if a Control and/or Trigger Level is breached”. Therefore, taking in to account the groundwater velocity, information in the HRA and the site setting the proposed groundwater quality sampling frequency of annual (1 x year) is the acceptable minimum.

Agreed – annual frequency for groundwater (shallow and deep BH’s), lagoon water and discharge.

**Monitoring procedures are incorporated in to a Rhodia Ltd operational document; “RHODIA LIMITED OLDBURY SITE. HSE PROCEDURE P44. Rattlechain Landfill Site Management Procedures”**

**All locations, Canal discharge, u/s & d/s of canal, lagoon water and 6 groundwater boreholes are to be sampled on 6 monthly basis. Which exceeds EA minimum requirements, so accepted – 09/10/2013.**

### **1.2 Groundwater Monitoring Suite**

This is not explicitly proposed in the reviewed documentation. Therefore, I would recommend that they adopt the suite detailed in the section entitled “Groundwater Samples” on page 12 of ESID Report, plus elemental P. This is tailored to site specific requirements and would meet the minimum requirements of our guidance (ref 1).

Agreed – suite in ESID report will be adopted. Benzene also to be added – see note below.

**Monitoring procedures are incorporated in to a Rhodia Ltd operational document; “RHODIA LIMITED OLDBURY SITE. HSE PROCEDURE P44. Rattlechain Landfill Site Management Procedures”. The monitoring suite discussed and agreed has been incorporated in to this document. Accepted - 09/10/2013.**

### **1.3 Groundwater Monitoring Infrastructure**

Currently there are 6 monitoring boreholes at the site, 3 are located in shallow made ground and 3 in Etruria Marl. This is the minimum number (3 in each hydraulic system) required to comply with our guidance (ref 1) and so is acceptable. However, the applicant should provide proof of the current efficacy of these boreholes (including geological log, installation log and proof of total depth compared to drilled depth).

Agreed – boreholes will be investigated and report produced including any proposals for replacement/maintenance.

**Monitoring procedures are incorporated in to a Rhodia Ltd operational document; “RHODIA LIMITED OLDBURY SITE. HSE PROCEDURE P44. Rattlechain Landfill Site Management Procedures”. Table 1 in this report confirms the total depth of these boreholes and has provided separately geological logs and construction details for all boreholes. Confirming the minimum requirement of 3 in each system and their current functionality. Accepted – 09/10/2013.**

### **1.4 Groundwater Control and Trigger Levels**

Groundwater Control and Trigger Levels provide a warning mechanism if adverse impacts are found and should therefore relate to contaminants found within the site being monitored. Proposed groundwater Control and Trigger levels are provided in Table 5 of HRA report. I would recommend that SO<sub>4</sub>, Ni, Zn, P<sub>2</sub>O<sub>5</sub> are added to the list of C&T Levels as they are all shown to be present at detectable concentrations within the lagoon water (ref 2). Also recommend that Pb and Mn are removed as there is no evidence of these contaminants being present at significantly elevated concentration in lagoon water and are likely to be associated with an historic or off-site source.

Agreed – list of C&T levels to be amended as above. In addition benzene is to be added to analytical suites as it has been detected up to 0.23 ug/l on occasions. Benzene will also be added to C&T list initially as a precautionary and inclusive measure (resulting from rumoured early disposal at the site pre-dating disposal licensing).

In Table 5 the Permit Holder has incorrectly set control levels at an EAL or Regulatory Compliance Limit. An EAL or Regulatory Compliance Limit should be used for as the Trigger Level or Compliance Level, unless background groundwater levels are already impacted naturally at concentration that exceed the EAL or anthropogenic pollution has resulted in background concentrations exceeding the EAL. Possible methodologies for deriving control levels might include;

- Where background quality < EAL, use the mean plus 2 SD's or maximum concentration (if proved not to be a statistical outlier) plus 10%. For Trigger/Compliance level use EAL/regulatory standard.
- Where background > EAL, use maximum concentration (if proved not to be a statistical outlier) plus 10%. Aim is not to allow any further deterioration in background quality. For Trigger/Compliance level use maximum concentration (if proved not to be a statistical outlier) plus 15%.

Our Guidance (**ref 3 and 1**) provides advice on deriving Control (assessment) and Trigger (compliance) levels. Groundwater Control Levels are site-specific assessment criteria that are used to determine whether a landfill is performing as designed and are intended to draw the attention of site management to the development of adverse trends in the monitoring data. If breached, they indicate that the landfill may not be performing as predicted. They should be regarded, therefore, as an early warning system to enable appropriate investigation or corrective measures to be implemented, rather than as an indication that groundwater pollution has occurred. Trigger levels or compliance limits are usually set at an appropriate EAL or regulatory standard and represent the level of contamination that constitutes pollution.

Groundwater quality should be compared to control and trigger levels at a minimum annual frequency (ref 3), which accords with proposed groundwater monitoring 1.1 above.

Agreed - C&T Levels will be reviewed in accordance with EA guidance as part of the HRA review below.

**See comments on Assessment and Compliance levels under Section 1.7 below. The above comments are addressed in the updated HRA and are incorporated in to the operational monitoring document “HSE Procedure 44” – 09/10/2013.**

**1.5 Surface Water;** Currently there seems little merit in requiring surface water sampling of the River Tame and tributaries, based on reviewed groundwater flow information and location of other landfill bodies. However, where discharges from the site are made the receiving water course should also be sampled, currently this would be the Birmingham Level Canal. **Ref 1** provides guidance on surface water sampling. Points I would highlight as being relevant; minimum of two monitoring points per receiving watercourse (one upstream and one downstream of discharge/site), include D.O., TSS & Temperature to groundwater monitoring suite, minimum frequency would be twice yearly whilst active controls/discharges occur.

Agreed that only the canal discharge will be samples, same suite as groundwater plus D.O., TSS & Temperature, as above. EA monitor u/s & d/s of discharge.

**Monitoring procedures are incorporated in to a Rhodia Ltd operational document; “RHODIA LIMITED OLDBURY SITE. HSE PROCEDURE P44. Rattlechain Landfill Site Management Procedures”. The Canal discharge and monitoring points 50 m u/s & d/s of canal discharge are to be sampled on 6 monthly basis. Which meets EA minimum requirements, so accepted – 09/10/2013**

**1.6 Leachate;** is not generated in the usual landfill sense at the site. However, I would recommend that lagoon water, as it is in intimate contact with the deposited waste body, is sampled on an annual basis (similar to groundwater).

Agreed.

**Monitoring procedures are incorporated in to a Rhodia Ltd operational document; “RHODIA LIMITED OLDBURY SITE. HSE PROCEDURE P44. Rattlechain Landfill Site Management Procedures”. Lagoon water is to be sampled on 6 monthly basis, which exceeds EA minimum requirements, so accepted – 09/10/2013**

**1.7 Hydrogeological Risk Assessment;** notwithstanding the comments made in relation to Control and Trigger levels above this report generally appears acceptable for this site. However, I note that the report is now 8 years old, there is an expectation that HRA's will now be reviewed every 6 years. The report identifies the likely hood that groundwater quality and lagoon water quality is potentially being influenced by off-site sources. The aim of this report should be to clearly characterise the waste body and consider then any risks to identified receptors. So any future review of this report should seek to make a distinction between contaminants from the Permitted/deposited waste and any resultant risks (which is the key aim of the report) and to the complexity of the site setting consider the influence of contaminants from on site made ground and off site sources in the context of the site. Additionally, any future review of this report would update the “technical precautions” & “requisite surveillance” sections in the light of an agreed monitoring regime and future engineering works at the site.

Agreed – a full HRA review will be undertaken in accordance with EA guidance (current) with an emphasis of characterising the lagoon source term and separating out external groundwater quality issues. To allow focussed future monitoring of performance at this site.

**A full HRA review has been undertaken by URS on behalf of Rhodia;**

**“Rattlechain Lagoon, Oldbury. Revised Hydrogeological Risk Assessment” dated September 2013 (ref:47066293).**

**This report should provides a detailed update of the site conceptual model, with updated actual groundwater level and quality data. In particular it identifies key contaminants and characterises quality within the waste body/lagoon water. This is compared to both upgradient and downgradient shallow and deep system groundwater quality. Key site contaminants are identified and a detailed hydrogeological risk assessment undertaken to consider the impact on a theoretical compliance point 50 m down gradient of the site. This shows assessment predicts that theoretical impacts on this receptor are acceptable and also presents results in terms of the nearest actual significant receptor, the R. Tame at 150 m down-gradient. So this review makes a clear distinction between contaminants from the Permitted/deposited waste and any resultant risks (which is the key aim of the report) and identifies and separates external impacts on groundwater quality from made ground and off site sources.**

**The report also updates the “technical precautions” & “requisite surveillance” sections in the light of the agreed monitoring regime and the completed engineering works at the site.**

**The HRA report methodology addresses the issues identified and previously discussed with the company and the predictions and conclusions of the report are acceptable.**

**The report also provides a review of Control (assessment) and Trigger (compliance) levels. This review identifies key site contaminants and that SO<sub>4</sub>, Ni, Zn, discussed in Section 1.4 above are likely to be as a result of quality impacts external to the site and so are not included in the list. The suite of determinants for which Assessment and Compliance levels have been determined is appropriate and accepted. Assessment and Compliance levels have been determined using the methodology discussed at the meeting with the Company and URS Consultants on the 08/03/2013. Accepted. Assessment and Compliance levels are incorporated in to the operational monitoring document “HSE Procedure 44” – 09/10/2013**

**2.0 I have also considered the following additional reports, which are relevant to closure;**

- Stability Risk Assessment (UK/EP 3839 PZ/B1.4.2)
- Landfill Gas Risk Assessment (UK/EP 3839 PZ/B1.4.3)

**2.1 Landfill Gas;** there is no organic source within the waste body so landfill gas in the usual sense will not be generated. However, due to the prevalence of made ground (on and off site), adjacent landfill and the potential for naturally elevated gas concentrations derived from geological sources; I would suggest that it would be in the Permit holders interest to monitor gas within the shallow (Drift) boreholes at the minimum frequency of once per year in order to establish prevailing ground gas concentrations influencing the site.

Agreed – made ground boreholes will be monitored as above.

**No details found in submission. Discussion with DW (EM) who has agreed that this requirement should go forward for inclusion in Rhodia's working monitoring document "RHODIA LIMITED OLDBURY SITE. HSE PROCEDURE P44. Rattlechain Landfill Site Management Procedures". DW to contact TD of Rhodia – 10/10/2013.**

I understand that there is limited potential for phosphine gas to be generated by the waste body. Likely gas generation rates and the physical layout of the site will ensure that gas generated in this way is very unlikely to migrate away from the site via geological pathways, therefore, there is limited value in monitoring for this gas in perimeter boreholes. Any phosphine gas generated in this way is likely to vent to atmosphere via the lagoon surface. It is difficult to suggest any practical way gas vented from the site in this way could be collected and monitored routinely. We would instead recommend that a short term study to determine if phosgene gas generation is occurring, this study could form the baseline from which to assess future risk and the need for routine monitoring. I understand that a body of work may have been undertaken for the Health Protection Agency which may satisfy or inform this work. I would recommend that any monitoring of phosphine gas agreed with the HPA should be incorporated in the final closure (gas monitoring) plan.

Agreed – it was felt there is a very small possibility that phosphine gas could be generated (Data from HPA review and update review will be used as an evidence based risk assessment in report form and initially monitoring for phosphine will be incorporated into the monitoring plan for the site).

**The Human Health Risk Assessment report from the HPA describes the results of a programme of phosphine monitoring and concludes that no ongoing monitoring for phosphine is required. In discussion with EM team, we accept the conclusion in this report. Therefore, ongoing phosphine monitoring post closure is not required – 10/10/2013**



**No details found in submission – 09/10/2013.**

**2.2 Stability;** the stability risk assessment report provided follows an accepted methodology. We note the low factors of safety calculated for the Northern Embankment in Table 5.0. Consequently, any proposal to work on or change this slope must be preceded by a detailed assessment of risks based on site specific values and must be agreed with ourselves and particularly Rail Track.

Agreed – an updated risk assessment with final design will be submitted for review and once approved be incorporated in to closure plan.

**I have reviewed the ERM Report “Rattlechain Lagoon – Proposal for North Slope Improvement” April 2013. This report considers stability of the slope along the north-east and eastern site boundaries during construction phase and then considers 3 options for long term stability of the slope during closure and beyond. TD of Rhodia confirmed that Option B has been implemented at the site. This involves a reduction in the weight of the slope at the edge of the lagoon by re-profiling the slope to the North i.e. displacing the general gravity point of the slope mass to the North resulting in less pressure on the steep soft underwater material. The solution utilises the available room around the perimeter to incorporate the optimum slope at 1/1.5 (33.7°). Surplus material excavated during re-profiling of the Northern slope is used to fill back the depression on the top of the slope and to correct other parts of slope. The design is also intended to addresses concerns regarding possible erosion of material from the Northern slope. The reduced slope angle, compaction, the incorporation of MacMat-R product are incorporated to reduce slope erosion. The predicted FOS is improved to 1.3. The report does not relate to waste stability but the slope surrounding the lagoon, so failure would impact on the lagoon engineering and waste, so is considered to be relevant to closure. Accepted – 10/10/2013**

### **3.0 Recommendations**

The Permit Holder Should Provide a stand-alone Water Monitoring Plan as part of the closure plan which should incorporate all of the recommendations in Section 1.0 and the hydrogeological risk assessment updated.

Agreed – will be provided as above.

Consideration should be given to a short term assessment of phosphine at the site and a detailed review of the stability risk assessment should be undertaken if any work is undertaken that could affect the stability of the Northern Embankment slope.

Agreed – will be provided as above.

### **References;**

1. Environment Agency (2003) Guidance on Monitoring of Landfill Leachate, Groundwater and Surface water.

2. Cremer and Warner (1990) Findings of the Site Investigation (1990-91) at the Rattlechain Tip Site, Oldbury, West Midlands. Vol I & II.
3. Environment Agency (2010) H1 - Technical Annex to Annex (j): Hydrogeological Risk Assessments for Landfills and the Derivation of Groundwater Control Levels and Compliance Limits

Please Contact;

**John Davis (Technical Specialist – Groundwater)**

**Tel:** 01543 404809

**Email:** [john.davis@environment-agency.gov.uk](mailto:john.davis@environment-agency.gov.uk)