Cyfoeth Naturiol Cymru
Natural Resources Wales

Natural Resources Wales permitting decisions

Parry's Quarry Non-Hazardous Waste Landfill Refusal Decision Document

Refusal

We have decided to refuse the permit for Parry's Quarry non-hazardous waste landfill.

The applicant is RJS Civil Engineering Limited.

The proposed facility location is Parry's Quarry, Alltami, Flintshire, CH7 6NY.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements.

Purpose of this document

This decision document:

- explains how the application has been determined
- provides a record of the decision-making process
- shows how all relevant factors have been taken into account
- justifies the specific conditions in the permit other than those in our generic permit template.

Structure of this document

- Key issues
- Annex 1 the consultation, web publicising responses

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Key issues of the decision

1 Our decision

Our decision is to refuse the application for a non-hazardous waste landfill at Parry's Quarry, Alltami, Flintshire. We are refusing this application because there are several elements of the application that are unacceptable to Natural Resources Wales (NRW). The applicant has failed to demonstrate that the proposals will not be harmful to the environment and sensitive receptors surrounding the proposed site. The main areas of concern are air quality, odour, hydrogeology and stability and engineering of the external North and East embankments providing containment of the landfill.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements.

2 How we reached our decision

All of the application documents and further information provided to NRW by the applicant in response to 'Notices for further information' (Schedule 5 notices) notification have been assessed by NRW. Full technical assessment is detailed in Section 5.

The applicant hasn't provided satisfactory justification for the odour emission rates and dynamic odour emissions (in relation to the operational development of the sub-cell areas) used in their assessment and modelling. Furthermore, sufficient evidence of effective landfill gas (LFG) collection from temporary capped areas has not been provided in the odour impact modelling assessment. We informed the applicant that we did not agree that the emission rates and dynamic odour emissions used in the original modelling were correct and requested that the modelling be repeated based on appropriate rates. New odour modelling was submitted but was based on the original emission rates rather than revised rates as requested. The new modelling predicted odour levels at sensitive receptors to be up to four times higher than the benchmark in the Environment Agency's H4 Odour Management guidance[1]. The revised odour modelling predicts that it is likely that the H4 odour benchmark level of 1.5 odour units (OU_E/m^3) will be exceeded. The guidance document describes odour from a biological landfill as 'Most Offensive' and the benchmark for this type of odour is set at 1.5 OU_E/m^3.The applicant's odour impact assessment also predicts that the World Health Organisation (WHO) Hydrogen Sulphide (H_2S) odour annoyance guideline value will be exceeded at some sensitive receptors as stated by WHO Guidance Document[2].

[1]https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296737/geho0411btqm-e-e.pdf

[2] Concise International Chemical Assessment Document 53: Hydrogen Sulphide: Human Health Aspects.

The proposed landfill is designed for construction with a basal lining system along the base and sides of the quarry void. The applicant has stated in the application that the proposed landfill is to be located entirely above the water table, however, the information provided in the application does not adequately demonstrate this. As a consequence we cannot be confident that the installation will not adversely impact local aquifers. NRW has given the applicant several opportunities to provide evidence to show that the landfill will not be located below the water table, however, additional data provided highlights numerous inconsistencies and therefore the design is not acceptable to NRW.

With regard to stability, the applicant initially proposed a Stable Non-Reactive Hazardous Waste Cell, however this has been amended to be an inert inter-cell with a compacted clay separation wall. Further clarity of the wall's 1.25 to 2.5m deflection is required in relation to the recent inert waste submission documents. The applicant proposed to remove an embankment at one end of the site however the applicant has not included this design element in stability considerations and it has not been considered within any of the application documents or the odour and noise modelling. In this regard the submission is therefore not acceptable to NRW.

Details of the inert wedge provided by the applicant has shared leachate and gas extraction systems. This would allow contaminant transfer between inert waste and MSW.

2.1 Receipt of Application

An application was received on 18th January 2016. Several elements of the application were either missing or unclear and therefore the application could not be duly made. This information was submitted and the application was accepted as duly made on 19th February 2016. This means we considered it was in the correct form and contained sufficient information for us to begin our determination, but not that it necessarily contained all the information we would need to complete the determination.

2.2 Consultation on the Application

We carried out consultation on the application in accordance with the Environmental Permitting Regulations (EPR), our statutory Public Participation Statement (PPS) and our Regulatory Guidance (Note RGN6 for Determinations involving Sites of High Public Interest.) We have considered the Well-Being of Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016 during our assessment process.

We advertised the application by a notice placed on our website between the 5th May 2016 and the 2nd June 2016, which contained all the information required by IED, including informing people where and when they could see a copy of the application. We also placed an advertisement in The Flintshire Leader newspaper on the 24th March 2016.

We sent copies of the application to the following bodies, which includes those with whom we have *"Working Together Agreements"*:

- Flintshire County Council Local Planning Department
- Flintshire County Council Environmental Protection Department
- Food Standards Agency
- Health and Safety Executive
- National Grid
- Primary Care Trust (Public Health Wales)
- Betsi Cadwaladr University Health Board
- Dwr Cymru Welsh Water – local sewerage undertaker

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly. In addition, we held a public drop in session on the 17th May 2016 at Beaufort Park Hotel, Alltami, Mold. All representations made were taken into account and a summary of those representations can be found at Annex 1.

Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 1. We have taken all relevant representations into consideration in reaching our determination.

2.3 Requests for Further Information

Schedule 5 'Further Information Notices' were served on the 17th May 2016 in relation to air quality and noise, to which the applicant responded on the 27th June 2016. A further Schedule 5 notice was issued on the 25th May 2016 requesting more information in relation to the Hydrogeological Risk Assessment (HRA); the applicant responded on the 15th July 2016. A further Schedule 5 notification was issued on the 31st August 2016 requesting further information in relation to the Hydrogeological Risk Assessment, Stability Risk Assessment and the Landfill Gas Risk Assessment and Management Plan; the applicant responded on the 18th October 2016. Copies of the information notices and the responses were placed on our public register.

4. The Installation

4.1 Description of the Installation and related issues

4.1.1 The permitted activities

The Installation is subject to the EPR because it carries out an activity listed in Part 1 of Schedule 1 of the EPR:

- S5.2 A1 (a) The disposal of waste in a landfill-
  (i) receiving more than 10 tonnes of waste in any day, or
  (ii) with a total capacity of more than 25,000 tonnes

4.1.2 The Site

The proposed landfill is located at Parry's Quarry, which is approximately 1km North East of the village of Alltami, Flintshire in North Wales. The site is accessed off Pinfold Lane just off the A494. The site is located within a large outcrop of carboniferous coal measures strata. It comprises predominantly mudstone with secondary sandstone and siltstone bands.

The site lies within a secondary aquifer, however it is not located within a designated groundwater source protection zone. The proposed site is situated on the flank of a low ridge approximately 10 km South of the Dee Estuary. The South and South West sections of the site are at an elevation of approximately 116m and rises Southwards to a maximum of 160 metres above ordnance datum (AOD) in Buckley. Land to the North East of the site has an elevation of approximately 90m AOD. The topography of the site area falls from 115m AOD at the South West corner of the site to between 105 and 110m AOD to the North and East of the site respectively.

There are residential properties located approximately 50m South East of the site. A hotel and restaurants are located less than 150m from the North Eastern boundary in a service area off the A55. There are a number of industrial units to the North and West of the site within 100 to 500m of the site boundary. A farm is located approximately 500m to the South.

To the South East of the site lies part of the Buckley Claypits and Commons Site of Special Scientific Interest (SSSI) and Connahs Quay Ponds and Woodlands SSSI, which in turn form part of the Deeside and Buckley Newt Site Special Area of Conservation (SAC). The SAC is separated from the proposed landfill and recycling plant by a metal fence designed to prevent newt migration into the working area of the quarry and the proposed landfill area.

4.1.3 Key Issues in the Determination

We are refusing this application because there are several elements of the application that are unacceptable to NRW and the applicant has failed to demonstrate that the proposals will not be harmful to the environment and sensitive receptors surrounding the proposed site. The main areas of concern and air quality, odour, hydrogeology, stability and engineering of the external north and east embankments providing containment of the landfill.

5 Minimising the Installation's environmental impact

Regulated activities can present different types of risk to the environment, these include odour, noise & vibration, hydrogeological aspects, stability aspects and landfill gas generation. All these factors are discussed in this and other sections of this document.

The next sections of this document explain how we have approached the critical issue of assessing the likely impact of emissions from the Installation on human health and the environment and what measures we require to ensure a high level of protection.

5.1 Assessment of Impact on Air Quality

This section of the decision document deals primarily with the dispersion modelling of emissions to air and its impact on local air quality.

The applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon human health and habitats. The air impact assessment, and the dispersion modelling was based on the Installation operating continuously at the maximum permitted emission rate. The applicant provided air dispersion modelling as part of the application which was used to assess the risk to human and ecological receptors within the vicinity of the site. This was assessed by NRW's Air Quality, Modelling and Risk Assessment Team (AQMRAT). Additional information was requested by Schedule 5 notice on 17th May 2016.

With regard to impact on local habitats, the air quality assessment included with the application calculated nutrient nitrogen and acid deposition based on deposition velocities that are recommended for lower vegetation. Lower vegetation are lichens and bryophytes (such as mosses and liverworts). They are non-vascular plants in that they do not have xylem and phloem to transport water and nutrients. Conversely, higher vegetation are vascular plants such as flowering plants, grasses and trees. The deposition velocities are half that of the velocities recommended for use when higher vegetation is present. The habitat features listed at the sites within screening distance of the site included woodland features, we therefore requested that the modelling be carried out using deposition velocities recommended for higher vegetation.

The Air Pollution Information System (APIS) gives site specific critical loads for acid deposition for features at the Buckley Clay Pits and Commons SSSI which are lower than those used in the original air quality assessment. We requested justification as to why the most sensitive critical loads from all habitats features listed were not used. Additional modelling data was later submitted by the applicant which used the appropriate deposition velocities and most sensitive critical loads for the habitats under assessment. The applicant concluded through their Schedule 5 response that for all modelled sensitive receptors, the Process Contributions (PC's) were in excess of 1% of the relevant Environmental Assessment Levels (EAL's), and therefore cannot be considered insignificant. In line with the Environment Agency guidance document 'Air emissions risk assessment for your environmental permit.' The response concluded that the emissions may cause significant impact if acid sensitive species are present.

As part of the assessment we audited the applicant's modelling assessment, due to the close distance between the Gas Utilisation Plant (GUP) emission points and the Deeside & Buckley Newt Sites SAC and Buckley Clay Pits and Commons SSSI. For nitrogen deposition, the applicant predicted that PC's in the western part of the SAC/SSSI closest to the GUP are 25% of the Critical Load range. NRW modelling indicated an acid deposition PC of approximately 25% of the lower critical load at the Deeside & Buckley Newt Sites SAC.

The background acid deposition was taken as 2.43 keq/ha/y for Nitrogen and 0.49 keq/ha/y for Sulphur. The PEC's as a percentage of the lower critical load was above the 70% threshold. This cannot be considered an insignificant emission and is likely to cause a significant effect on the SAC, however we have not carried out an 'Appropriate Assessment' as required by the habitats regulations because we are refusing the application on other aspects.

5.2 Assessment of odour impact

The applicant provided odour modelling and an odour management plan as part of the application. This was assessed by NRW and additional information was requested by Schedule 5 Notice on 17th May. The applicant responded to the Schedule 5 Notice on the 1st July 2016.

Within the odour report originally submitted with the application, the applicant applied their own defined waste input stream in the GasSim Modelling. We requested justification and evidence for the proposed redefined separated commercial and industrial waste streams. The applicant provided a response to the request and proposed a redefined waste input stream with low carbon content. We agreed with the low Carbon C&I approach as detailed in Table 11 of the applicants Landfill Gas Risk Assessment (LFGRA.)

In the original odour assessment both Met Office Numerical Weather Prediction (NWP) and Hawarden observed met data was used. The NWP met data used in the applicant's modelling included the parameters of sensible heat flux and boundary layer height. According to the ADMS model developer, CERC, if using NWP data with a 4km resolution (as the applicant used), the ADMS met processor is better at predicting these parameters than the NWP data. We therefore requested that the ADMS met processor be used to calculate these variables. The applicant responded that they were unaware of this recommendation from CERC with regards to the use of NWP data and had therefore undertaken liaison with CERC. CERC advised the applicant that no formal guidance has been issued with regards to the use of NWP data.

It was noted that CERC had not carried out any testing to compare the different options using NWP data. It was also noted that the applicant considered, that when using NWP data with a 4km resolution the ADMS met processor may be better at calculating these parameters, however they state that no actual testing of this has been carried out by the model developers and no formal guidance has been issued. In the November 2016 ADMS 5 User Group Meeting, CERC formally presented the advice in the Question & Answer section that if the Met Office NWP model grid spacing is greater than 1.5 km, then the ADMS met processor should be used to calculate sensible heat flux and boundary layer height[3]. Environment Agency H4 guidance advises that for odour impact modelling, observed met data (which normally does not include the parameters of sensible heat flux and boundary layer height) from a representative meteorological station should be used. If such a station is not available or the site has specific local features that are likely to influence dispersion significantly, consideration should be given to the use of site specific predictive meteorological datasets, i.e., NWP met data. When using observed met data from a representative station, the ADMS met processor calculates sensible heat flux and boundary layer height from the cloud cover & wind (from the observed met data) and surface characteristics data which are also used as inputs to the ADMS modelling. It is current best practice not to use sensible heat flux and boundary layer height from the NWP model but to allow the ADMS met processor to calculate these parameters from the NWP cloud cover, wind and surface characteristics data. Hawarden Airport is approximately 7 km to the proposed landfill site, and conditions are likely to be representative of those at the proposed landfill. In this case, the applicant is expected to use the observed met data or the extracted NWP met data without containing the parameters of sensible heat flux and boundary layer height in their odour modelling assessment. These parameters should be calculated by the ADMS met processor.

The area surrounding the proposed site is undulating and slopes do not exceed 1 in 10. CERC advises that terrain effects should be considered if the slope of the terrain exceeds 1 in 10.

[3]http://www.cerc.co.uk/user-area/assets/data/downloads-ugm/CERC_2016_UGM_ADMS_Question_and_Answer.pdf

Minimum turbulence values are different in ADMS for flat terrain (slope < 1:10) and complex terrain (slope > 1:10). However, the applicant used the terrain module in the ADMS modelling. The applicant responded that; *"although CERC guidance is that usually terrain heights are only included if the gradient exceeds 1:10, this does not mean that terrain should not be included where the gradient is less than 1:10".* This is not the case as the model developer's guidance should be followed when running models. Higher concentration was predicted following the model developer's guidance in this case.

The applicant did not agree with our observations and interpretations, however the applicant repeated the models where ADMS calculated sensible heat flux and boundary layer height, and without the terrain module. In these models the predicted odour concentrations were significantly higher than those in the original odour assessment. The H4 Odour guidance benchmarks are based on the 98th percentile of hourly average concentrations of odour modelled over a year at the site/installation boundary. The benchmarks are:

1.5 odour units for **most offensive** odours;

3 odour units for **moderately offensive** odours;

6 odour units for **less offensive** odours.

Any modelled results that project exposures above these benchmark levels indicates the likelihood of unacceptable odour pollution. The applicant's revised model predicted that there will be odour concentrations of up to 6 OU_E/m^3 at a number of sensitive receptors. This is potentially up to 4 times above the benchmark for odour pollution, which is not acceptable to NRW.

The applicant proposed a maximum tipping area to be used in the landfill of 450 (15 x 30) m^3 this is different from the recognised area in the SNIFFER report which is 800 – 1200m^3. This was confirmed to be the case with the applicant and the area of 450m^3 was therefore considered appropriate.

In the original odour assessment, Table 5.5 assumed a number of odour emission factors. These emission factors however were not explained fully. Justification was requested in the schedule 5 notice. The applicant's schedule 5 response stated; "*In the absence of data for odour emissions from C&I wastes, to provide a conservative assessment, the average of the reported lower and upper OERs for freshly tipped municipal* ***UK*** *waste were taken to inform the assessment. The resulting OER was 3.64 ouE/m2/s. This was incorrectly stated as 3.8* $OU_E/m^2/s$ *in Table 5.5 of the original report."* The applicant's schedule 5 response referred to the SNIFFER report, which reviewed published studies on odour emission from landfill deposition area and presented six datasets in Table 7 of the report. Each dataset had a lower value and an upper value. The applicant excluded two datasets in the upper end of the range among the six datasets by arguing that those landfill sites in the studies were not in the UK. The applicant then took an average of the remaining four datasets to get an averaged odour emission rate (OER) of 3.64 $OU_E/m^2/s$. We repeated the calculations to check but we got 3.8, not 3.64 $OU_E/m^2/s$. The main problem with this approach is that the lowest OER among the six datasets was also measured from a non-UK landfill site, this site was actually in Belgium. If this dataset is also excluded to be consistent, then the averaged OER would be 4.3 $OU_E/m^2/s$. Furthermore, the approach to take an average of the reported lower and upper OERs may not provide a conservative case assessment. If the more appropriate OER value of 4.3 $OU_E/m^2/s$ is used then the odour levels measured at sensitive receptors will also increase above the current unacceptable levels predicted.

In the original application there was no detailed information on dynamic odour emissions in relation to the operational development of the sub-cell areas and evidence of effective landfill gas (LFG) collection from the temporary capped area within an operational cell. This was also not considered in the pro-rated approach based on the GasSim output with a view to provide a worst case scenario. This was highlighted in the original auditing report of the application prior to issuing a schedule 5 notification. As the applicant used a different approach to the standard GasSim cell-based emission method, we requested detailed information, evidence and justification as to why this has not been used. The schedule 5 response did not address our request on their sub-cell approach on odour impact assessment. For this aspect of the assessment we have not received the information that we requested.

The applicant used GasSim to generate odour emission rates for input in the ADMS model for operational, temporary and permanently capped areas of the landfill. The operator argued that "*The ratio of the GasSim generated OER for the operational waste area for the low carbon C&I waste to standard waste composition is 32%. Previous work undertaken by SGP has measured OERs for temporary and permanently capped areas of a landfill as 0.32 and 0.04 ouE/m2/s respectively. The resulting pro-rated OERS based on the above calculation for these areas are therefore 0.10 and 0.01 ouE/m2/s respectively".* However, the applicant did not provide the details of the SGP's OER measurements for temporary and permanently capped areas, 0.32 and 0.04 $OU_E/m^2/s$, and the details of the landfill site, covers and measured OER value range, and their comparison to the SNIFFER report. Based on experiences at sites in Wales (taking a reduced biodegradable and higher C&I fraction including transfer station fines), higher H_2S levels in the landfill gas continues to be reported. H_2S is a main component of landfill odour.

We previously requested that as the applicant did not have any site specific baseline gas data that they not use the GASSIM default H_2S trace gas distribution (which was based on data collected before 2007), but instead use the distribution derived from the Environment Agency spreadsheet, containing 1012 measurements from hundreds of landfill sites from 2007 to 2014. The applicant used this data set as requested to generate their H_2S emission rates.

In conclusion the applicant's schedule 5 response presented some revised odour model plots where higher odour impact was predicted. The applicant hasn't provided a satisfactory justification for their odour emission rates or dynamic odour emissions in relation to the operational development of the sub-cell areas. Furthermore evidence of effective landfill gas (LFG) collection from the temporary capped area within an operational cell has not been considered in the odour impact modelling assessment. However, even with the applicant's own unjustified odour emission rates, the revised odour modelling predicts that it is likely that the H4 odour benchmark level of $1.5OU_E/m^3$ will be exceeded by up to 4 times at some sensitive receptors. It is also predicted that World Health Organisation H_2S odour annoyance guideline value will be exceeded at some sensitive receptors.

5.3 Noise Assessment

The applicant provided noise modelling as part of the application. This was assessed by AQMRAT and additional information was requested by Schedule 5 notice on 17th May. The applicant responded to the notice on the 1st July 2016.

Within the original noise assessment that accompanied the permit application the existing quarry at the site was operating during the background monitoring, and the assessment stated that "pecker" machinery noise was audible at three of the four monitoring locations. We requested justification that the background values used in the assessment are representative of background conditions during the operation of the proposed landfill. The applicant's response stated that; '*even though the pecker machinery was audible at times, the assessment was based on an* L_{A90}, (L_{A90} is the noise level exceeded for 90% of the measurement period, A-weighted and calculated by Statistical Analysis). *This means that it is unlikely to be affected by short-term noise and no noise correction in the modelling is required.'* Even though it is preferential that the background measurement is representative of expected conditions during the proposed operations (i.e. excluding sound generated be the pecker), we accept the statistical explanation above, assuming that the pecker is only occasionally audible.

In the original application the noise assessment did not take into account the impact due to noise emissions from the gas engine and flare. We requested modelling of the impact. The applicant provided additional information (Table 7 of the noise assessment), which table highlighted the noise level of the flare and combined heat and power (CHP) engine. However within the noise modelling files submitted to us, there were no sources representing the CHP engine and gas flare. We did not receive any further modelling files from the applicant in their schedule 5 response.

Within the modelling files provided with the application the applicant applied a time histogram to some of the dump truck sources. They have been defined as being operational from 0700-2300, contrary to the report stating "there will be 4 dump trucks working during normal operations".

We requested clarification of the operating hours of the dump truck noise source. The applicant corrected the noise models to reflect the information in the report, this is deemed satisfactory.

The original noise assessment included a Waste Transfer Station building which was not specifically modelled. We requested that this building be modelled as a building with noise emitting facades. The applicant carried this out and added the building to the model. However, within the noise model the applicant constructed the building using noise barriers as walls and roofs (leaving one side of the building open), with noise sources placed inside. The reason for the method used by the applicant was not included and NRW considers that the building should have been modelled using noise emitting facades.

Interrogation of the submitted noise modelling files showed model predictions of 47 decibels (dB) and 46dB for day and night predictions at the first floor level of receptor 4. This was 4dB and 5dB higher than the value reported in the original noise assessment. We therefore requested clarification for the discrepancy between the predictions presented in the report and those given within the noise modelling result files. The predicted values were amended in the schedule 5 response. The new values were a closer match to those from the original modelling files submitted. There was still a discrepancy however between the reported daytime prediction at receptor 4 and the prediction output in the original submitted modelling. We have not received further modelling files submitted alongside the Schedule 5 notice.

Although the applicant has provided additional information in relation to the noise assessment, no further modelling files were submitted with their response, therefore we have been unable to substantiate any of the comments made by the applicant and some of the issues mentioned above remain unresolved.

5.4 Hydrogeological Risk Assessment

Geologically, Parry's Quarry is located within a large outcrop of carboniferous coal measures strata, comprising predominantly mudstone with secondary sandstone and siltstone bands. The Coal Measures underlying the Parry's Quarry site and surrounds are designated as a Secondary (A) Aquifer. Secondary Aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The applicant provided a Hydrogeological Risk Assessment (HRA) as part of their application, which was assessed by our hydrogeological specialist. This was found to be incomplete. The missing information that was required consisted of colour copies (unsecured pdf format) of the reports submitted as part of the application, additional daily driller logs & the final construction logs for monitoring boreholes, raw data (excel files etc.) used to produce graphs for groundwater levels & quality and the electronic LandSIM files for the assessment.

This as initially requested by informal email on the 11th May 2016 however only part of the information was provided so a 2nd informal email was sent on 23rd May 2016. The 2nd email requested the final construction logs for the boreholes installed in 2015 and the raw data (excel files etc.) used to produce the graphs for groundwater levels and quality. Again the full list of information requested was not provided so a Schedule 5 notice was issued on the 25th May 2016.

The Schedule 5 notice requested copies of the formal borehole logs for the 13 new boreholes installed in June/July 2015 (labelled as GWBH1-13 in the HRA). This was because the application had only included the daily driller logs which charted the progress of the boreholes as they were being drilled. These logs did not provide information on how the monitoring point was constructed and which part of the aquifer was being monitored, additionally the reference numbers for the driller logs did not correspond with the boreholes named in the text of the HRA.

A formal response to the Schedule 5 was submitted by the applicants on the 15th July 2016. The response contained an excel file with the entire dataset of groundwater levels. The response also confirmed that there are no formal construction borehole logs for the 2015 batch of monitoring boreholes and only the daily drillers logs that were provided in the application are available. The applicant stated in their response that; "*The monitoring installations within the current groundwater monitoring boreholes are standpipes, the boreholes were not fitted with piezometer installations. It is well understood (and is reported in the HRA) that the groundwater beneath the site is confined with sub-artesian head generated by a small number of water bearing beds. The current groundwater monitoring boreholes monitor the overall position of the groundwater piezometric head immediately surrounding the site. The base of the proposed landfill has been designed to be at a level above the recorded current and historic position of the piezometric head".*

Detailed assessment of the HRA was carried out by our hydrogeological specialist. This identified that additional information and clarification was required on a number of matters, which were critical to the assessment of the HRA and determination of the permit application. This additional information was requested by Schedule 5 notification on the 31st August 2016 and comprised:

- Within chapter 2 (Installation design) of the HRA it is stated that the base of the landfill is to be at 84.5-86mAOD, which is consistent with the 'level of the confined groundwater system'. Drawing 2434/1/012 however notes that 'Groundwater shown as a confined piezometric head' at an elevation of around 87mAOD. We requested further information to clarify this.

- We noted that further works are required and additional information is required to demonstrate that the landfill is located above the water table/piezometric surface as the water level data provided was unclear. Table 2 in the HRA summarises the groundwater level information for the 13 new boreholes installed in 2015. The bedrock groundwater surface is shown to be above the proposed landfill base in this table. The monthly water level information provided, records groundwater levels which are consistently above the proposed base of the landfill.

Following the previous schedule 5 response it was clarified that these are providing an 'average' head of water rather than accurately reflecting the water table or piezometric surface within a specific geological horizon. As part of the schedule 5 response the applicants have attempted to cross reference the 2015 installed boreholes with historic boreholes, some of which were installed to monitor targeted horizons. The data from these all record groundwater at levels above the base of the proposed landfill. For example, BH4-06 is a 10m deep borehole in the east of the proposed landfill, screened between 92-83mAOD. It recorded a water level of around 95mAOD.

- Chapter 8.4 (Surface Water Monitoring Schedule) of the HRA included the following *"In the long term, the landfill will cover the entire base of the site and quarry floor water management will not be required. Similarly the potential for groundwater management is also a temporary activity, only required for the period until sufficient waste have been landfilled to prevent basal heave"*. We requested clarification because elsewhere the applicant states that the landfill has been designed to be above the piezometric surface or above the water table.

- It was also noted that the previous permit application was on the basis of a hydraulically contained landfill, with the base at around 80mAOD and the application stating water levels of around 8-10m in the north of the site and up to 20m in the south of the site. The current permit application has a proposed base of 84.5-86mAOD and states it is located above the water table/piezometric surface. Due to the inconsistency we requested further clarification.

- There were also some irregularities with the Landfill design as Chapter 2.7.5 of the ESID details the sidewall lining system and the document stated that; "*the leachate drainage layer shall extend to a x-position 3m vertical above the toe level of the sidewall. A drainage geo-composite shall be used to provide leachate drainage to the sidewalls above 3m"*. We requested further information showing how this design would deal with any localised perched leachate which may be generated and act on the sidewall.

- Chapter 5 (conceptual model) and Figure 19 of the HRA described the removal of the water bearing siltstone band directly beneath the landfill base and the use of a compacted mudstone backfill. The purpose of this was stated as reducing the potential for basal heave and removing a potential preferential flow pathway directly beneath the site. We requested clarification as to whether any CQA had been undertaken to assess the effectiveness of this work and also to demonstrate that the use of this compacted mudstone backfill has altered the hydrogeology as the applicant had described.

- With respect to the applicants LandSim risk assessment we recommended that sensitivity analysis was undertaken with a particular focus on the following parameters which required additional justification;

  i. **Infiltration (total)** – Data from Moel y crio was used which is located around 9km away from the site. NRW maintain a climate station in Northop around 3km from the site. We believe that this would provide a more reliable estimate of infiltration over the application site.

  ii. **Effective Rainfall.** The figures provided by the applicant of 248mm equates to effective precipitation of approximately 32%. We requested further justification of this figure.

  iii. **Unsaturated pathways conductivity.** Table 7 of the risk assessment stated ‘not used’ but values have been attributed in the model. Further justification was requested as to the basis for the values used and had any CQA been undertaken on the compacted mudstone backfill.

  iv. **Aquifer thickness.** A figure of 100m had been used in the assessment. The figure appeared high, taking into account the nature of the surrounding geology. Further consideration was required on what would be considered effective for transmitting water.

v. **Compliance point.** The Alltami brook (approx. 250m to the North of the landfill) was selected as the compliance point on the basis of no current abstraction and the perceived lack of resource value of the groundwater. Horizontal Guidance Note H1 Annex J3 guidance 'Additional guidance for hydrogeological risk assessments for landfills and the derivation of groundwater control levels and compliance limits' for surface water receptor states that; *"Inputs of non-hazardous pollutants should be limited so as to avoid pollution of groundwater. In most instances the compliance point for non-hazardous pollutants will be monitoring boreholes adjacent to the landfill. In some instances, where groundwater has no current or potential future resource value, boreholes further from the site may be appropriate. The selection of a compliance point other than at the perimeter of the site would have to consider the sensitivity of the location of the landfill. Where groundwater has not been determined as a receptor, the compliance point could be a surface water feature in the vicinity of the landfill. The selection of a surface water feature as a compliance point is only likely to be acceptable where the consideration of all the S-P-R linkages has identified the surface water as the highest priority risk, and where we agree that it represents the most significant (water) receptor for any contamination from the landfill, (that is where groundwater is not a useable resource and is for example, Unproductive Strata.* Further justification was required as to why a compliance point nearer to the site in the underlying Secondary Aquifer was not chosen as resource value is not limited to suitability as a potable source.

A response to this second Schedule 5 request was received on the 18th October 2016. We concluded that the additional information provided in the latest Schedule 5 response did not adequately cover the concerns we have raised through both Schedule 5 notifications that have been issued to the applicant. There remains a lack of clarity over the conceptual model of the site and how the landfill relates to the surrounding hydrogeology.

The additional information supplied by the applicant in response to our Schedule 5 notifications does not provide confirmation that the landfill will be located above the water table as detailed in the permit application. We have on several occasions detailed above, requested further information to demonstrate that the landfill is located above the water table as the water level data provided is unclear.

This lack of clarity is in part due to the poor standard of the monitoring boreholes which were installed as part of the application. These boreholes are, due to their construction, providing an 'average' head of water rather than accurately reflecting the water table or piezometric surface within a specific geological horizon.

The bedrock groundwater surface is shown to be above the proposed landfill base in Table 2 of the HRA. The monthly water level information provided records groundwater levels which are consistently above the proposed base of the landfill. This suggests the landfill may be located below the water table. In their second Schedule 5 response received on 18 October 2016 the applicant stated that the landfill is above the water table for the following reasons:

- The applicants have partially constructed Cell 1. This has involved excavating to a depth of 80mAOD and backfilling with compacted mudstone. Following construction the applicant stated; *"Other than very minor water ingress after rainfall at upper sidewall levels the cell base and sidewall have been dry of groundwater since spring 2016…..The quarry workings have provided absolute proof that the base of the quarry is above free groundwater and that groundwater is confined by impermeable rock"*. As part of these works groundwater ingress was recorded at 86mAOD which was removed by pump and the applicant *"continued to excavate rock to approximately 80m OD. No further groundwater ingress was encountered during the operations to deepen the quarry to the 80m OD level"*. Groundwater is present at around 86mAOD, we assume in the siltstone band the applicants are removing and replacing with compacted mudstone. Whilst Cell 1 appears dry the bases of Cells 2-4 are at lower elevations but the information provided in the application and Schedule 5 responses do not discuss their interaction with groundwater.

- The Schedule 5 response stated *"groundwater is localised below the site because it is confined by competent and impermeable strata. Groundwater will not interact with the proposed site because it is confined; groundwater is not physically present above the proposed base for the landfill"*

The response further explained that *"The borehole logs from the deep boreholes that were drilled in 2000, 2006 and 2012 to an elevation of between 21 to 47m AOD (approximately 60m to 40m below the proposed base of the site) record that groundwater was not struck at depths below the groundwater encountered at elevation varying between 80mAOD and 95mAOD*). *It is our strong opinion that these deep borehole logs indicate the total lack of free groundwater to a significant depth beneath the site."* There appears to be some conflict in the above statements made by the applicant. One paragraphs states that groundwater is confined by competent and impermeable strata but then further states that the borehole logs show that groundwater was not struck below 80mAOD. It is therefore not clear which geological formation the applicant proposes is confined and produces the water levels around 87mAOD as shown in Figure 5 of the HRA. This has not been explained in sufficient detail by the applicant and as such cannot be properly and meaningfully assessed.

If confined groundwater is in a formation above 80mAOD, it is unclear what is generating sufficient confining pressure to generate a groundwater head of several metres to reflect the water level data provided, again this hasn't been fully explained by the applicant in either the application or subsequent Schedule 5 responses. The 13 monitoring boreholes installed in 2015 are of a poor standard and detailed construction information for their installation was not included in the application. The construction information as subsequently requested by Schedule 5 notification was not provided by the applicant. The boreholes were also constructed in such a way as to make understanding groundwater levels at discrete horizons impossible.

The applicants are proposing additional boreholes as detailed in the 'Installation of Gas & Groundwater Monitoring Boreholes Quality Assurance Method Statement. In the Schedule 5 response received 18 October 2016 the applicant stated that these will have specific response zones to enable the monitoring of groundwater piezometric heads surrounding the site.

These boreholes if located and constructed appropriately may provide vital information to demonstrate the relationship of the site with the surrounding hydrogeology. However, as this information was not available in the application or subsequent Schedule 5 responses we were unable to consider further at this time.

The Schedule 5 response included an updated drawing 2434/1/006 B titled 'Engineering Drawing 2'. This drawing detailed the groundwater drainage system located beneath the geological barrier of the landfill. The purpose of the drainage layer is not addressed in the application or the HRA. Its inclusion suggests that groundwater is or will be present above the base of the landfill, which requires collection and pumping. This contradicts the information provided by the applicants in their schedule 5 responses, where they stated that *'groundwater is not physically present above the proposed base for the landfill'* and *'The landfill is to be constructed above the free water surface. This is primarily to remove the need for active groundwater management, a practice which is not intended to be implemented'*

Our guidance; '*Horizontal guidance Note H1 Annex J3. Additional guidance for hydrogeological risk assessments for landfills and the derivation of groundwater control levels and compliance limits',* states; that where a site relies on the control of water levels by means of an engineered collection system (for example, a drainage layer or pumping wells) the water in that collection system always constitutes groundwater unless the collection system is hydraulically isolated from natural groundwater by the geological barrier. In other words, although the collection system forms part of the management system for the site, the 'prevent or limit' requirements of the Environmental Permitting Regulations (England and Wales) 2010 (EPR) apply to the water contained within it. At this location the groundwater drainage layer is located outside the geological barrier and is therefore not considered to be hydraulically isolated from natural groundwater. The 'prevent or limit' requirement of EPR therefore applies and the HRA provided does not address this.

In our Schedule 5 notice dated 31 August 2016 we highlighted that Chapter 8.4 (Surface Water Monitoring Schedule) of the HRA included the following; *'In the long term, the landfill will cover the entire base of the site and quarry floor water management will not be required.*

Similarly the potential for groundwater management is also a temporary activity, only required for the period until sufficient waste has been landfilled to prevent basal heave." This comment has not been adequately addressed by the applicants. The applicants have not explained if the landfill is located above the water table as they contend, if this is the case our question of why there is a need to prevent basal heave, has not been answered.

With regards to the LandSim Risk Assessment we still have outstanding concerns over several of the parameters used in the assessment. In addition the LandSim assessment provided has not considered the presence of groundwater in the drainage layer which is located beneath the engineered barrier.

In conclusion the information provided in the original application and subsequent Schedule 5 responses has not fully addressed the concerns that have been raised over the design of the landfill and how it relates to surrounding groundwater. We have given the applicant several opportunities to provide the additional information and justification required to address the outstanding concerns. It remains unclear if the landfill will be located above the water table as stated in the Environmental Permit application. This has implications for the design of the landfill, its operational management and the risks to groundwater.

As this fundamental matter remains unresolved an Environmental Permit cannot be granted.

5.5 Stability Risk Assessment

The applicant provided a Stability Risk Assessment (SRA) as part of the application This was found to be incomplete and several elements required further clarification.
Within the documents the applicant proposed to erect a separation wall in the landfill to separate Municipal Solid Waste (MSW) from the Stable Non-Reactive Hazardous Waste (SNRHW). The structure proposed by the applicants consultants differed significantly from the details provided in the SRA in the application.

Such that in the application it is stated that the wall will be inclined and rest on SNRHW, whereas the consultants proposed a vertical structure. We requested that the applicant generate a revised SRA or an amendment to the SRA for such a variation.

Monitoring infrastructure for each cell that can demonstrate how effective the separation wall would be at keeping the leachate and LFG systems independent long term was also requested. The applicant proposed to have a common leachate system with basal stone drainage connecting the MSW & SNRHW cells beneath the separation bund/layer.

The leachate drainage system of herringbone pipes and spine drains would also be connected and the leachate monitoring points would penetrate the separation bund/layer. The applicant has therefore not developed physical separation of the wastes and this would allow leachate from the MSW area to enter the SNRHW area and vice versa. This method is not acceptable to NRW as there needs to be consistency with the requirement for physical separation where there should be two independent leachate systems. This needed to be reflected in the applicant's water balance calculations & HRA. We therefore requested revised drawings (including leachate managemnent systems) and details of the systems.

Within Table 2 of the SRA, Global Stability of Waste/Asbestos Waste Separation Bund, figures were quoted of 18 to 20kN/m^3. We requested justification as to whether these figures are reasonable for varied wastes including insulation & 11-13kN/m^3 for MSW (TR1 indicates 8.8-10.5kN/m^3). We asked the applicant if the engineered clay values were used for the MSW/SNRHW/Separation Wall/Separation Layer as it does not appear to be compacted.

Within Appendix G – Stability of cell infrastructure, detailed calculations were included for the MSW, however information based around the equivalent infrastructure in the asbestos & inert waste (CEDW) would be beneficial. We therefore requested that the applicant provide a brief paragraph on their experience of using values CEDW for Table 2 or discuss the parameters chosen for c' and Ø', is c' of 4kPa reasonable and was there a need for the target pads in these calculations.

Within the SRA the applicant showed that favourable Factors of Safety are achieved, however for the separation wall/layer a larger factor is required. The design of the separation wall/layer is to lightly compact the bottom 1m of the first 2.5m bund wall lift, above this it has no specific compaction at all.

Furthermore the varied SNRHW streams will need accommodating in the engineering design as there are increased opportunities from different density materials to allow the separation bund to adversely deform. The suture where the cells are sacrificially capped needs engineered thought in the design, as the sacrificial cap extends over the separation bund/wall.

Drawing: 1004C for phasing is indicative of one inclined separation wall in N-S plane and sacrificial capping in E-W plane. We requested a further explanation specific to the condition.

Within Appendix B of the SRA – Veneer Stability, there were a number of factors and values assumed. Further explanation was requested in relation to where the Characteristic Tensile Strengths were taken from for geotextile, HDPE, FML & GCL.

Further detail was also requested in relation to a number of values used within the SRA. We requested justification for the cohesion value c' used for drainage stone or the drainage stone/geotextilex interface in Combination 2, the c' for drainage stone, the interface friction angles δ' or δ_u for drainage stone/geotextile interface in Combination 1, as these values didn't relate to Table 3.0. The input values therefore needed to be justified.

In the combination 1 & 2 scenario's different shoe sizes were used for the bulldozer. We requested that the applicant provide the specification for the D6d bulldozer used and justification for the "Un-factored Loads" adopted.

As the bulldozer manufacturer 'Caterpillar' didn't have the specification ready to hand and in view of the range of D6 bulldozers available, it was necessary that we specified that the plant used in the landfill does not exceed those provided in calculations and this needed to be confirmed.

In the SRA, the applicant detailed the proposed drainage systems. We requested that the applicant justify why the groundwater spine drain finished beneath Cell 1 and did not diverge or swing round to the SW, we also requested that the drawings were amended as necessary.

The applicant stated in the SRA that; "*the base and lower vertical 3m of the sidewalls to each cell (Reference Drawing 2434/1/006A) will be covered with a 300mm thick leachate drainage layer comprising 10-20mm clean, fines".*

There was inconsistencies between documents in the application, such that the ESID included a Geo-composite Liner (GCL) and leachate drainage via 300mm 10/20 stone up vertically 3m from sidewall toe and then geo-composite. The HRA excluded GCL and refers to 500mm stone thickness. We requested a specification detail and further clarity, and clarity to whether HDPE spine or collector drains be reinforced/rigidrains or smooth and what the pipe perforations would be.

We noted that there is GCL Protection when using concrete foundations for Leachate Collection Point's (LCP's). We contend that either appropriate polythene backed GCL is required or some LLDPE spread beyond the concrete footprints over the GCL would be preferable to geotextile protection. For MSW cells the foundation bases for Leachate Monitoring Points (LMP's) & LMC's are the same (3m x 3m x 0.6m) and in view of frequency of retro drilling leachate LMP's & LMC's, we requested further information on why the applicant did not extend the foundation bases to a wider area beneath the target pad. Furthermore, the SRA did not explain the HDPE protection, we requested additional information relating to the protection of HDPE on the side slope above the granular leachate blanket.

In the previous application we raised concerns in relation to the large desiccation cracks and trees growing in the Northern and North Eastern areas of the outer landfill embankment. We therefore requested further information to help demonstrate suitability for the embankment to be included in construction for Cells 3 and 4.

The above information was critical to the assessment of the SRA and therefore the information was requested by Schedule 5 notice on the 31st August 2016; the response was received on the 18th October 2016. We asked a number of questions in the schedule 5 notice that required the applicant to provide additional information and clarification in relation to the proposed asbestos cell.

In their schedule 5 response the applicant stated they had removed the need for the SNRHW cell within the landfill and claimed there was no need to have independent leachate systems for the replacement inert and soils cell. The landfill will however retain a universal base and sidewall leachate collection system, thus allowing hydraulic connectivity between the inert soil and MSW phases within each cell (i.e. below and around the separation wall). Connectivity will also be intercellular if leachate is not managed below the levels of inter cell walls. Landfill gas will therefore also be able to pass between inter cell phases and individual cells, potentially causing additional odour issues.

Whilst this does not unnecessarily cause undue complications for stability or introducing controlling management measures, it does mean waste products can migrate into the 100m inert waste standoff, which is required by the planning consent to remain as solely inert waste, this inert wedge is in place due to the close proximity of other businesses to the landfill.

If leachate can migrate as the response suggested then this would not remain as solely inert waste, this has not been fully explained in the subsequent schedule 5 responses. Furthermore the Eastern LMP's are shown on the Engineering Drawing to be positioned so that they penetrate the separation wall (SW) into the inert soils phase. Leachate recirculation is also proposed that will increase leachate strength and with hydraulic and gaseous connectivity within each cell the inert standoff may be considered compromised, with the common system present.

The retention and design amendment of the separation wall (SW) from placed and lightly compacted to compacted engineered clay is welcomed, as is the receipt of modelling, which has been accepted.

It is acknowledged that inert soils or soils upon which the compacted SW rests, will have greater stiffness parameters and therefore only modest deformation is anticipated. There is however a more fundamental variance of view here between the applicant & NRW. The applicant has anticipated that asbestos and inert waste will display the same engineering parameters. NRW is of the view that asbestos waste could display equivalent properties, but with these wastes including double bagged products that can include fibrous insulation, woven products as well as cementitious product, it may not have the same density or stiffness, hence the previous NRW request for modelling and commentary on experience of strength parameters. The most recent submission appears to justify the proposed use, however it has not been possible to interpret the proposed deflection of 1.25m to 2.5m on the surface from the outputs provided. Further, NRW is of the view that this has not been addressed for asbestos type wastes although the applicant included asbestos within the definition. Therefore should the applicant intend to change waste types from inert soil and soils to more compressible, less stiff wastes it should be noted that this has not been considered within their application or subsequent Schedule 5 responses and therefore a redesign and justification would have to be submitted for the SW design and construction.

In the schedule 5 notice we asked for clarification on the use of target pads. We considered this unnecessary for use within the asbestos cell, whereas the use of a target pad within an inert soils phase/cell is accepted.

NRW undertook some of the Veneer System calculations, but to cross reference across the range of simulations provided by the applicant would take an inordinate and disproportionate amount of time. Therefore we asked the applicant to provide the excel spreadsheets used in the Appendices. The applicant provided clarification on the calculations. We had previously acknowledged input parameters for Global Stability of Sidewall Subgrade and Liner, however we were not able to confirm the spreadsheet equations and calculations as the applicant did not want to provide their spreadsheet and calculations for review. These values were therefore accepted at face value only.

It is stated in the application that, '*the base and lower vertical 3m of the sidewalls to each cell (Reference drawing 2434/1/006A) will be covered with 300mm thick leachate drainage layer comprising 10-20mm clean, fine'*. Further detail was required and requested by schedule 5 notification. We requested that the applicant explain why 20/40 stone was not specified and; if the drainage extend up the inter-cell bunds. The applicant stated that *'the design for the basal liner system including the first 3m vertical height of sidewall has been revised to include for a sand protection layer with separation geotextile cover to directly overly the protective geotextile. This layer will enable the use of 20/40mm sized leachate drainage stone because it will provide complete protection from puncturing damage to the underlying FML. The proposed depth of the sand layer is 200mm over the landfill base and increased to 300mm on the sidewall. The drainage will extend up and over the inter-cell bunds as shown on Drawing 2434/1/006A.'* The applicant's explanation is not clear as the "common" leachate basal stone drainage layer is required to have a full thickness of 300mm of 20/40 type stone up to a vertical height of 3m on sidewalls. Above 3m a 300mm confining pressure is required for the GCL, the design allows a sand protection layer to accommodate this. Any variance would require a technical submission and justification to NRW which was not provided. "Common" is used as the drainage layer extends beneath both MSW and insert soil phases within each cell.

In response to our questions about providing justification for not extending the foundation bases to a wider area beneath the target pad, the applicant has proposed to agreeing the detail with the CQA Engineer at a later date, this is reasonable to NRW.

We had concerns regarding the large desiccation cracks and trees growing in the overly steep Northern and Eastern embankments. We requested further information via schedule 5 on the above items to support the Stability Risk Assessment (SRA). The applicant's consultant TCL identified these structures as temporary that will be removed and reconstructed as the landfill progresses. The design and SRA for these structures are said to be undertaken as the development progresses. These embankments provide screening for neighbours and it is unclear if their removal has been factored into the planning consent. As the embankment acts as a screen to neighbouring locations, removing it could potentially increase odour, dust and noise from the site.

This issue was not considered in the modelling for the site and has therefore not been considered by the applicant. This is not acceptable to NRW as additional odour, dust and noise annoyance may be caused by the site.

5.6 Landfill Gas Risk Assessment

The applicant submitted a landfill gas risk assessment and management plan as part of the original application and this was assessed by our landfill gas technical specialist. This was found to be incomplete and several elements required further clarification.

Within the landfill gas risk assessment it stated that; *'each cell will be filled to their pre-settlement contour levels over an expected 25-30 month period for cells 1-3 and 5 months for the smaller cell 4'.* This statement was not justified and did not provide any contingencies. As a result we requested that the applicant provide details on what would happen if the waste inputs were below what was expected and if there was any contingency plan in place do address any of the problems that may arise from a reduced waste input and filling rate.

We assessed the filling rates and depths at which the waste would sit. In the application it suggested that it would take 30 months for the waste to reach a depth of 43m, this ultimately means that there will be large areas of deep waste that will not have deep retro drilled gas well or any means to remove water. If the input rates of waste are reduced there could be up to 30m of waste with inadequate gas extraction and no de-watering of perched leachate, this could be for long periods of time. The result of this could be the build-up of perched leachate, flooding and failure of pin wells and loss of control. We therefore requested that the gas extraction management and infrastructure design be amended to reflect the above comments.

The proposed gas extraction system in the application did not represent best practice for a landfill within a sensitive location. Following detailed discussions and meetings between the applicant and NRW landfill gas technical specialist we requested that the applicant re-design their extraction system with the following aspects in mind. This plan was then to be re-submitted to NRW for assessment;

i) Consider the use of flight auger method to drill pin wells

ii) Revise valves on pin wells and other extraction wells to better quality – to improve gas flow control where practicable.

iii) No manifolds / minimise manifolds

iv) Gas flows within the pipework to flow in the same direction as condensate flow wherever possible

v) Shorten or eliminate the 63mm diameter pipe runs as much as possible – branch into 160mm diameter sub mains as close to wells as possible, etc.

vi) The length of pipe-work between well and gas main should be reduced to the minimum wherever possible.

vii) The use of correct phasing and retro-drilling of 160-225mm vertically drilled gas wells before final levels are reached will be considered an essential part of any gas extraction proposal.

viii) Add in proposal for 24hr contingency call-out if gas infrastructure problems / odour complaints

ix) Add flexibility into the management arrangements – the applicant will need to liaise with NRW on an on-going basis to respond and adapt the gas management systems to current BAT / best practice

x) Minimise operational waste area, use a banks-man if necessary

xi) Maximise use of cover and blading back on the working area, to conserve cover and reduce perching where practicable

xii) Utilise dewatering wells as necessary

xiii) Use graded / varied slotted extraction pipework to draw gas from depth, not just shallow levels

xiv) Regular site walk-overs – smelling for gas and testing with gas monitor; record the results. The site should use a Gazomat Laser Methane Detector and instruments such as a Jerome monitor for H_2S/FID to perform regular surface emission surveys.

xv) The operational methods should include a use of daily cover that minimises the risk of water 'layering' / perched leachates

xvi) Gas mains to be laid as close to extraction wells as possible with a minimum 1:50 fall where gas flow is in the direction of water flow, otherwise a 1:25 fall will be required

xvii) No barometric knockout pots to be used only sealed and pumped.

xviii) Include a pumping strategy to avoid perching within gas extraction wells.

xix) Adopting a flexible approach to the issues that arise during the filling of the landfill in such that all options to achieve maximum gas extraction efficiency, including temporary drilled wells, horizontal wells, pin wells and all other techniques at the applicants' disposal are considered.

xx) Where bentonite is considered to be the sealant of choice for gas wells, it should be pre-mixed, with the details of the mixing and sealing procedure to be included in any relevant CQA plan.

xxi) Ensure that booster and flaring set up is appropriately sized (using variable speed booster if necessary)

xxii) Standby generator will be essential for the site to ensure if there is a mains power outage that the flare and extraction system will continue to operate.

In the application document it is stated that; '*landfill gas will be managed by active abstraction and destruction, initially using a flare system, until LFG generation rates increase to a level which can support electricity generation at which point a gas utilisation engine will be employed*'. Therefore we believed that a clear set of actions to detect early onset of gas production and the triggering of a finely balanced extraction system with expert field management is essential to achieve best practice control at this site. We requested that the applicant amend their Landfill Gas Management Plan, Landfill Gas Risk Assessment and associated documentation to take into account the above comments.

The expected disposal rates stated in the application are in the order of 325,000 tonnes per year, with a potential fill range between 250,000 tonnes and 400,000 tonnes per annum. The potential variation is mainly due to the different waste type densities and the supply of waste materials available. These values were not fully explained in the application, so further justification of these figures was requested.
The application stated that; *'At least 35,000 tonnes per annum will be diverted to the inert off-set area to ensure that biodegradable wastes are maintained a minimum of 100m from the A55 Gateway Services receptor buildings. This inert off-set zone parallels the zone between the base of the eastern sidewall slope and the eastern edge of the landfill across for all four cells*'.

In the event that planning permission for a stable non-reactive hazardous waste cell is granted, the site management plans and risk assessments will need to be adapted to reflect the added risk. We requested revised procedures and risk assessments in regards to the SNRHW cell to provide full details of the proposed operation including waste types and mitigation measures, procedures for reception and deposit and expected composition.

The application further stated that*; 'Due to the predominance of two prevailing wind directions the potential sensitive receptors to both the south east and north-west are considered to be predominantly downwind from the site'*. It should however be noted that many of the issues associated with landfill odour do not occur when prevailing wind conditions dominate but they are most prevalent during periods of cool calm weather in the morning and early evening. During these conditions the gas in largely undiluted form 'rolls' off the site with any slight breeze causing the gas to migrate largely undiluted to receptors, causing serious odour issues. It is within this context that gas management and emissions prevention should be addressed. With this in mind we requested that the applicant update the landfill gas management plan/Risk Assessment and associated documentation accordingly.

The landfill gas risk assessment constituted a 'Tier 3 assessment' as stated in the application, however there were no occupational risk assessments provided and therefore we requested that the applicant provide an occupational risk assessment giving due regard to relevant health and safety legislation. Including the risks to personnel who may be operating close to sources of high Hydrogen Sulphide within the landfill.

Also evidence suggests that the mix of wastes currently entering landfills is likely to result in early on-set of methanogenesis, with levels stabilising after an initial and often unexpected large volume of gas in the early stages of landfilling. This is highly dependent on the waste entering the landfill and therefore we requested that the applicant update the gas management plan and site controls to reflect this.

Within the application it is stated that; *'the relationship of increasing emissions followed by an immediate depletion, is illustrative of the predicted implications of implementing a robust and balanced abstraction system and the early implementation of an effective capping layer'.* This statement is based on many assumptions, the robustness of the system along with input rates and changing conditions. Changes to input rates, waste types, rate of filling, water ingress and phasing of cells create ongoing problems which mean that the design of the landfill gas extraction system, management system and infrastructure should reflect this. The current proposal do not meet these requirements in full. We therefore requested that the Landfill Gas Management Plan (LFGMP) and associated documents be reviewed and amended to take these factors into account.

Figures 7, 8 and 9 showing Gassim Odour Units Production, figures presented in the assessment illustrated a level of H_2S and CS_2, with mass emissions but no interpretation of the impact of such an emission on the odour at receptors. Due to this fact we requested an interpretation of impact on odour.

In the application it is stated that; '*there are two significant sensitivities within the GasSim model, the first is collection efficiency of a gas system and the second is the quantity of degradable wastes to be received*'. We therefore requested that the applicant propose a comprehensive system of gas management and infrastructure that will ensure that the site does not cause harm to human health or the environment or detrimental impacts to the amenity of the locality. We requested that the LFGRA and GMP be re-submitted taking into account the details discussed in guidance meetings with NRW.

The application also stated that; '*similarly the worst-case predicted emissions through the capped surface of ~100m^3/hr and most likely rate of 75m^3/hr are also unrealistically elevated for an active gas management system, where discernible surface emissions are not expected to occur (Figure 12)'.* We disagreed with this statement as the likely emission rates stated in the application in fact do seem reasonable and are not worse case. Any reduction in bulk gas caused by a reduction in carbon input ratios doesn't mean a corresponding reduction in the odour causing gases.

Based on this finding we requested that this statement was revised in the management plan and that both documents be adapted to include contingency measures to deal with high intensity of rainfall, given the sensitive nature of the site.

Within the initial application the Gas Sim model that was used predicted that there would be negligible lateral emissions through the sub-surface. This limitation is due to a combination of active management in combination with the provision of a gas impermeable artificial sealing liner. Consequently it was not considered to be a potential risk to off-site receptors due to below ground level landfill gas migration. The impermeable HDPE liner will indeed represent a barrier to gas migration. These barriers can tear and therefore we required that rigorous measures are in place to ensure that the liner is installed without tears or holes as this can lead to gas migration. A comprehensive and detailed CQA procedure with puncture/tear detection where practicable should be part of this process. For this reason perimeter gas monitoring wells would need to be installed. Representative gas monitoring wells should also be installed and background data provided for 12 months prior to the deposit of waste. We requested that the applicant submit the details of the wells and background data for the required timescales.

The application stated that; *'the surface emission rates are likely to be representative of the emissions associated with an extended failure of the active gas management controls. However, observations at active landfill sites readily demonstrate that even when a cell is operational, landfill gas emissions can be controlled. The GasSim predictions are therefore a function of a modelled hypothetical system designed to identify the worst-case scenarios and hence define the baseline conditions against which the gas management system should be designed'.*
It is our view that extended failures should not occur at such a sensitive site and practical contingency measures should be in place to ensure that this does not occur (such as a standby generator to keep the system running following a mains power outage). In light of this we requested details of contingencies and plans to mitigate the above mentioned risks.

The Renewable Obligations Certificates issued to provide an elevated feed-in tariff for the generation of electricity from landfill gas has now ended and the government has decided to end its support for such schemes. Due to this fact we asked whether a cost benefit analysis had been undertaken to ensure that gas utilisation is an option at the site to ensure compliance with the Landfill Directive and whether the applicant had contacted the utility company to ensure that the grid has the capacity to receive electricity generated at the site?

The application stated that*; 'the pin wells will be designed to collect gas from between 2.5mbgl and 6mbgl.* We note that pin wells won't be effective at 2.5mbgl, we therefore requested that this statement within the management plan was revised.

The application stated that*; 'with regards to lateral migration into the open quarry void, the key control will be to maintain a low gas pressure within the main body of the landfill. By maintaining a low pressure there will not be an excessive pressure driving odorous volatile gases from freshly deposited wastes towards the surface'.* Based on this statement we required that the applicant include; protocols for retro drilled well design and the balancing of gas pressures to avoid air ingress through side walls in the final management plan and that the applicant also confirm that the benches will be constructed in such a way as to allow for drill rig access.

Within the Landfill Gas Management Plan (LFGMP) it indicated that the flare would not be in place until 2017 and this would need to be revised depending on input rates. Based on this we requested confirmation on how soon after detecting the relevant amount of gas being produced could a flare and associated gas infrastructure be installed?

The LFGMP also stated that *'Landfill gas extraction will be required following the first year of inputs'.* This statement was not acceptable to NRW. Landfill gas extraction should begin as soon as the risk of issues associated with emission arise, where practicably possible using BAT. We therefore requested that the risk assessment within the application be updated to reflect this statement.

In the application it is stated that; *'the gas wells will be installed as part of a rolling programme as the waste placed in each individual phase reaches final level, and will be installed (as soon as practically possible) following construction of the engineered cap. This also enables the maximum amount of landfill gas to be abstracted from the waste mass. Details of gas well specification and installation are contained in the MSE Gas Control System Design Statement (GCSDS.* The installation of deep drilled gas wells only on the completion of the final phase of each cell as stated above is not be acceptable to NRW. Retro-drilled sacrificial landfill gas extraction wells will be vital to ensure that gas is extracted and controlled using properly designed wells, with sensitive adjustments using valves for each well. These wells are also essential for de-watering perched leachate which causes serious issues with the extraction of gas across all sites in Wales. The proposed method did not enable the maximum amount of LFG to be extracted from the waste mass as gas may be produced within 2 months (depending on input rate and composition). With the requirement for best practice under the Landfill Directive (LFD), this proposal would result in unacceptable, uncontrolled emissions and was not considered by NRW to be best practice. We therefore requested that the risk assessment be updated to reflect these changes.

In section 3.3.7 of the LFGMP it is stated that; *'sacrificial gas (and odour) control pin wells will be installed as required, as successive lifts of each phase are completed and temporary capped, (see Phasing Plan 2434/1/016) to a specification as detailed in the attached GCSDS. All installation details, including depths and locations will be agreed with NRW prior to commencement of works. Specification of proposed temporary capping is detailed within the accompanying ESID, and is expected to consist of 1mm thick LDPE FML. The temporary gas and odour control wells will either be extended as required with each successive lift, or buried following each lift'.* This part of the plan was incomplete and we therefore required more information;

- We requested further information regarding pin wells and how will any blockage of pin wells with water and the many lengths of 63mm connecting pipe-work be dealt with to avoid deformation and condensate build up?

- In conjunction with this we also required further information on how gas suction pressures would be varied in application, across the field using a wholly pin well system until final capping?
- We know that pin wells have a short lifespan after burial, we therefore needed to know how the applicant proposed to extract gas from depth once these pin wells were redundant, particularly where a deep quarry site is concerned.
- Given the sensitive location of this site and how imperative it is to collect the highest percentage of total landfill gas produced, justification was sought that reliance on a pin well system only until final levels were reached in each phase would achieve this?

In the application it stated that; *'the well screen will pass through the cap via a purpose made-hole and sealed into the plastic liner using a welded boot-detail. At each well, a wellhead with valve flow control will be provided to allow the well to be linked to the extraction system. The wellhead will also facilitate access for gas and water level monitoring. The well heads are designed to be as robust as possible, and will be sealed in the period between their construction and connection to the collection main to prevent uncontrolled emissions to atmosphere'.* Based on the points made in the application, we requested further information asking whether the well would be directly welded to the cap or if it would be contained within an extra piece of welded pipe and if the latter was the case how will the 'well screen' prevent air being pulled through the annulus? The well head should also facilitate access for leachate pumps. The pumping system must be specified and designed before the LFG extraction system will be considered best practice, this wasn't specified in the application documents submitted to NRW.

The application also stated that; *'the proposed final as built GCS installation will comprise of 52 permanent full depth control vertical gas wells, 6 permanent full depth control pin gas wells and the placement of 7 new 6 to 10 port manifolds to be connected into a 355Æ mm main carrier.*
The gas wells will be connected into the GCS via 63Æ mm gas collection flow lines connected to the installed manifolds.

A new knock-out pot (KOP) controlled condensate management system will also be installed (Refer to Section 3 & 4, see Appendix F 'Scope Of Works', and see Appendix E (ei) 'Parry's Quarry Gas Collection System (GCS) Design')'. As this was unclear during the assessment we asked the applicant to explain what was meant by '6 permanent full depth control pin gas wells'.

As stated above pin wells by definition are not to full depth and give limited temporary control in restricted areas. We required justification for the use of manifolds as part of the gas collection system, as this is not usual practice. The gas field balancing protocol was also not in the management plan so we requested that the applicant include it within their revised plan or associated documentation. It was also unclear why barometric drains were being proposed in the final design? We asked the applicant to justify this and if they are to be installed, what controls will there be to ensure the water is maintained within the pot and prove they will not be overcome at any stage by the pressure exerted on the field?

In relation to odour the 'H4' guidance provides a regulatory framework by which a permitting officer can ensure an installation's compliance by the provision of specific conditions. H4 states that the Best Available Technique (BAT) is often site-specific and can be determined by the controls necessary to meet benchmark odour concentrations at ground level at sensitive receptors'. Based on this we requested that the applicant demonstrate that the proposed controls within their landfill gas risk assessment and management plan are capable of reducing the impact of odour from the site to below the benchmark levels described by H4, and therefore requested an integrated description of how management plans, maintenance and infrastructure will allow for the operation of the site without breaching the benchmark levels for odour at the sensitive receptors. However the odour modelling has highlighted the fact that odour emissions will be above the H4 benchmark by a considerable amount.

The application stated that; *'the applicable monitoring techniques in this context are interpreted as the daily odour monitoring methodologies (olfactory) up and down wind of the site, and where necessary at localised sensitive receptors. Monitoring of operational control measures are listed separately.*

These have been reviewed in the context of the most recent guidance (i.e. H4) and discussed in greater detail in Section 6 of this OMP'. Whilst olfactory odour methodologies are useful and provide an initial baseline for the subjective perception of odour, the use of instruments such as a Jerome meter for measuring Hydrogen Sulphide should also be considered along with any other empirical techniques that may be applicable to enable an accurate measure of the impact of odour from the landfill. With this in mind we required that the applicant re-write this section in the management plan to reflect the comments made.

In the application it stated that; *'the following sources of odour are considered in this section of the assessment':*

1. *Odours from incoming wastes from handling and deposit;*
2. *Odours from wastes exposed during waste disposal activities;*
3. *Odours associated with landfill gas venting from leachate abstraction wells and unconnected pipework.*

The odour sources will include any piece of infrastructure which penetrates the waste, surface emissions of gas in a pressure driven environment, horizontal fissure flow and surface emissions through the waste and any cracks that may occur during settlement. The Odour Management Plan should be adapted to include these sources of odour. Furthermore trommel fines and other C&I waste may contain high levels of Gypsum waste, this can result in high levels of H_2S not in proportion to the amount of landfill gas produced but at a much higher relative level. We therefore requested that the odour management plan and modelling interpretation be amended to reflect this.

The management plan states that; *'as the phase of disposal in each cell progresses, the operational areas will be progressively temporarily capped and sacrificial pin wells retro-installed to provide adequate odour control. Extracted landfill gas will be directed to the associated flaring system or to the gas utilisation compound'.* As we have requested numerous changes to the control measures and management plans on-site, we requested that the odour management plan be amended with the new control proposals.

The application further stated that; *'If sufficient quantities of gas are being produced by the waste, it may be necessary to carry out a pumping trial to determine the need and specification of any more permanent gas control plant (engine or flare). It may be necessary to deploy a temporary flare at a suitable location should gas emissions and/or odour be of a significant issue, prior to connection to the permanent control system. The potential impact of emissions from the flare and/or gas utilisation will be subject to a separate risk assessment (See Report: 2434-R03) outside the requirement of this OMP'.* Due to the sensitive nature of the site steps need to be taken in advance of landfilling to understand the nature of the waste deposited and to anticipate the production of greenhouse and odorous gas and have a management plan in place as discussed above to ensure gas and odour issues do not occur. We requested that such a plan be submitted covering possible scenarios and the odour management plan adapted accordingly.

GasSim Modelling within the LFGRA & LFGMP

Within the submitted GasSim modelling the moisture level inputted into the model was 'average'. We requested that this be changed to 'wet', to better reflect the conditions on-site. We also requested that the gas plant specification of engines to be changed to a 0.3m orifice diameter for stack emissions which is more common for gas engines.

The values used with the model were incorrect and therefore we required that the H_2S values be changed. Further information was required in relation to section 6.2 of the LFGRA as to the Log normal values of 169.9, 3.3 ppm. These have been used in the model, but should have been converted to mg/m^3.

Furthermore, based on experiences at sites in Wales (taking a reduced biodegradable and higher C&I fraction including trommel fines); we are now finding much higher H_2S levels in the raw inlet gas on some sites. Accordingly, NRW has re-run the model using a suggested Log triangular of 10, 200 and 750 mg/m^3 H_2S. As a result the model shows a reduction in bulk gas (from a peak of 1,250m^3/hr in 2024 to 1,025m^3/hr) but an increase in surface emissions of H_2S from 44g/hr in 2018 to 88g/hr, and a peak of 96g/hr.

As the above information was critical to the assessment of the landfill gas risk assessment and management plan, the information was requested by Schedule 5 notice on the 31st August 2016; the response was received on the 18th October 2016. From the resonse provided the applicant met the requirements for the gas system to be in-line with the standards required of such a system. All of the points that were raised in the schedule 5 notice have been satisfactorily addressed by the applicant and accepted by NRW. Specifically in relation to the most contentious areas the applicant has met all of the requirements with regard to the flare and booster provision on site, the standby systems, the well type and retro drilling for the gas system, de-watering of the gas system, cell management, gas flow and the use of reduced operational area (tipping area) using a banksman. Other areas that have been addressed are the temporary capping, pipe sizing, field balancing, emergency and standby arrangements (including the provision of a generator in case of power outage and a 24hr standby response), well sealing, reduced waste inputs, DSEAR/ATEX and H_2S risk assessments.

In some cases the applicant has gone beyond the standard requirements, proposing a pre-mixed 5m bentonite seal on all of the drilled wells, the use of 90mm pipe-work and up-rated control valves, the use of direct well head connections to pipe-work instead of using manifolds and the use of state of the art monitoring equipment for H_2S and Methane. The applicant has also proposed the use of variable speed boosters and multiple small flares to deals with the strategic problem of varied requirement for vacuum in different parts of the site as filling takes place and to control early onset of gas production.

However the main issue to be resolved is the provision of background data from pre-installed perimeter monitoring wells. The applicant has addressed this by setting the standards in Waste management Paper 27 as a default until the data can be provided. As the site will be lined with HDPE this is acceptable to NRW.

5.7 Financial Provision

We have not undertaken an assessment of the applicant's financial provision as NRW has material concerns with aspects of the design and potential risk from the proposed installation, which have led to our decision to refuse the application. Therefore we are unable to agree that the calculated financial provision is appropriate.

5.8 Habitats Assessment

We have not undertaken a full habitats regulations assessment as NRW has material concerns with aspects of the design and potential risk from the proposed installation, which have led to our decision to refuse the application.

5.9 Waste Acceptance

We have not undertaken an assessment of the proposed list of waste types to be accepted at the installation as NRW has material concerns with aspects of the design and potential risk from the proposed installation, which have led to our decision to refuse the application.

5.10 Closing Statement

As the fundamental matter of whether the base of the landfill is above or below the water table remains unresolved and the issues with stability of internal structures and odour pollution, an Environmental Permit cannot be granted.

ANNEX 1: Consultation Reponses

A) Advertising and Consultation on the Application

The Application has been advertised and consulted upon in accordance with NRW's Public Participation Statement. The way in which this has been carried out along with the results of our consultation and how we have taken consultation responses into account in reaching our draft decision is summarised in this Annex. Copies of all consultation responses have been placed on our public register.

1) Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from Betsi Cadwaladr University Health Board/Public Health Wales

The local Health Board/PHW requested a permit condition including robust emissions management plans (dust, odour and noise), strict waste acceptance and handling criteria and provision of an accredited environmental management system (EMS) is recommended.

The regulator should be satisfied that emissions from the permitted activities should not lead to a breach of the air quality objectives at any sensitive receptor locations.

The regulator should be satisfied that the applicant's fire prevention plans are robust and comply with current guidance.

They also recommended that risks to watercourses and groundwater are controlled through good site management practices.

Finally they advised that the former Health Protection Agency (now part of Public Health England) produced a position statement "Impact on Health of Emissions from Landfill Sites" in 2011.

The Health Protection Agency (HPA) recognised that the practice of disposing of waste materials to landfill can present a pollution risk and a potential health risk. However, modern landfills are subject to strict regulatory control which requires sites to be designed and operated such that there is no significant impact on the environment or human health. The HPA concludes that there was no new evidence to change the previous advice that living close to a well-managed landfill site does not pose a significant risk to human health.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/334356/RCE-18_for_website_with_security.pdf

If NRW did issue a permit all of the above comments would have been considered through permit determination and the use of appropriate permit conditions.

Response Received from Flintshire Council Planning Department

The response received from the LPA advised us that the applicant does not have planning permission to accept asbestos wastes at the site and will need to vary their permission before they can do so.

Whether or not a facility has planning permission is not a consideration under EPR.

2) Consultation Responses from Members of the Public and Community Organisations

A number of the issues raised during the consultation process are outside NRW's remit in reaching its permitting decisions. Specifically questions were raised which fall within the jurisdiction of the planning system, both on the development of planning policy and the grant of planning permission. Specific planning issues raised related to the location of the site, the location of the landfill gas engine stack, traffic movements and emissions from off-site traffic movements.

Guidance on the interaction between planning and pollution control is given in PPS23 Planning Policy Wales.

It says that the planning and pollution control systems are separate but complementary. We are only able to take into account those issues, which fall within regulatory scope of the Environmental Permitting Regulations.

a) Representations from Local MP, Assembly Member (AM), Councillors and Parish / Town / Community Councils

We received comments from local councillor Carol Ann Ellis, concerns were raised in relation to the levels of dust and noise, reassurance was also requested about how levels would be controlled - We have not assessed this as application is to be refused on other grounds

There were also concerns with the effects of the landfill on the Newt site in close proximity to proposed site – We have not assessed this as application is to be refused on other grounds

If NRW did issue a permit all of the above comments would have been considered through permit determination and the use of appropriate permit conditions.

b) Representations from Individual Members of the Public

1. There are concerns raised by a member of the public in relation to the high levels of lorry movements associated with the proposed landfill – This does not fall under EPR and as such is a planning consideration

   There are concerns surrounding odour of the site – The odour pollution is part of the reason we are refusing the application

   There are concerns with noise from the proposed landfill – noise pollution has been assessed and could be dealt with through permit conditions.

   There are concerns with impacts to the countryside and wildlife - We have not assessed this as application is to be refused on other grounds

2. There are concerns raised by a member of the public in relation to odour and close proximity to food outlets – hazards to health - The odour pollution is part of the reason we are refusing the application

   There are concerns regarding litter - We have not assessed this as application is to be refused on other grounds

   There are concerns with noise from the proposed landfill - noise pollution has been assessed and could be dealt with through permit conditions.

   There are concerns that the visual impact of the proposed landfill could have – This does not fall under EPR and is a planning consideration

   There are concerns with recent flooding that affected the service station – permit is to be refused

3. There are concerns from a member of the public that dust could damage the surrounding properties – the permit is to be refused

   There are concerns with the effects on human health that the landfill could have – Public Health Wales consulted (response above), permit is to be refused.

   There are concerns with the high volume of traffic connected with the site – This does not fall under EPR and is a planning consideration

   There are concerns with the potential de-valuation of property if the proposed landfill was to go ahead – This is not a consideration under EPR, however the permit is to be refused.

4. Oaktree consultants were employed by a number of local businesses who opposed the proposed landfill site. The consultants were concerned with the odour – the issues raised by Oaktree have been assessed by NRW and have formed part of the basis for the application to be refused
   Environmental impact to the surrounding area is of concern also – the permit is to be refused.

If NRW did issue a permit all of the above comments would have been considered through permit determination and the use of appropriate permit conditions.

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