P0035 - 04

Subm No. 1

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

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7th April 2006

Ms.Liz Leacy,
Office of Licensing and Guidance,
Environmental Protection Agency,
Headquarters,
P.O. Box 3000,
Johnstown Castle Estate,
Co. Wexford.

IPPC Licence Review Application by Aughinish Alumina (Register No 754)

Dear Ms. Leacy,

Following my discussion with Dr Padraig Larkin recently I enclose a submission on the above along with supplementary information which we have sought externally. I attach copies of reports from colleagues in the Environmental Health Department which you may already have received. (Encl 1)

Yours sincerely,

TMB Greally

Dr. Tessa Greally FFPHMI
Acting Director of Public Health

c.c Ms. Annette Fitzgerald, Principal Environmental Health Officer, Limerick

Comments of Department of Public Health , Health Service Executive West(covering Limerick, Clare and Tipperary North) on IPPC Licence Review Application by Aughinish Alumina (Register No 754)

From a public health perspective the human health section of the EIS had the following limitations :

a) A literature review of the health impact of similar facilities worldwide was not undertaken
b) As a measure of occupational risk it had focused upon a review of occupational health records at the plant which was asserted not to demonstrate an excess of cancers, respiratory or neurological above general population rates(but for which statistics were not presented)
b) In terms of environmental risk for the surrounding population it had relied on the human health section of the Askeaton Animal Health Investigation rather than conducting it's own baseline study of human health parameters in the Foynes/Aughinish area. There are a number of reasons why this may not be appropriate:

1) The Askeaton Animal Health Investigation was not conceived as a study of the health impact of Aughinish Alumina, particularly in relation to the BRDA which is the subject of the proposed EIS. The Askeaton study did not set out to study respiratory morbidity in the locality of Aughinish which could theoretically be linked to an increase in dust emissions from an expanded BRDA.
2) The mortality and cancer data used in the study relate to 1990-1996 and 1994-95 respectively : the Aughinish Alumina plant commenced production in 1983 and the periods studied were relatively early in the production history of the plant. No updated information has been provided in the EIS athough geocoded cancer registration data at ED level covering 1994-2002 is available through the National Cancer Registry of Ireland.*
3) No provision is in place for ongoing collection of health data because of the absence of geocoding in current routine data systems other than for cancer
4) The literature review does not refer to the experience of dust blows in other metallic ore waste facilities with large surface areas such as the Silvermines which have led to difficulties at the post-decommissioning stage.

(* This can be made available to you if required by contacting the Public Health Department)

As Limerick Co. Council are concurrently considering a planning application our Department met on August 10th 2005 with Dr Dan Murphy of Tobin Engineering who had been retained by Limerick Co. Council to assess the extension application by Aughinish Alumina and communicated these comments to him. Further information sought by Limerick Co. Council from the company addressed the incomplete literature review : in Question 3 of the Further Request 1836 it requested Aughinish Alumina to " submit details of any literature searches carried out on both occupational health and environmental health of the workers in similar facilities" .
In response the company submitted an expanded literature review which again concentrated on the occupational health area and described studies undertaken in Australia which indicate that working in aluminium refineries does not have any major

adverse effects on respiratory health, cancer incidence, or mortality among workers. It concluded that " ***published literature on the impacts of the industry on occupational health is more widely available than information on environmental health***" and that " ***direct comparison of occupational and environmental health aspects of the Aughinish Alumina Plant with similar alumina refining facilities was not viable due to variability in a number of factors***".

The Department of Public Health had also requested a literature search in the context of potential health risks from the BRDA from the Chemical Hazards and Poisons Division of the UK Health Protection Agency.(Appendix 1) This confirmed the absence of published literature on the effects of the disposal of bauxite residue on local communities. It stated that "if the site is therefore properly regulated and adequate monitoring is put in place both inside and outside the site boundary, then the risk of airborne dust affecting the local environment should not be significant and the impact on health negligible."

In most developed countries it could be presumed by a licencing authority that routine health information systems could be relied upon to indicate a health impact of a respiratory or other nature in the surrounding population following the introduction of a new process or facility such as the BRDA; in Ireland this is not possible because of the absence of a postcode system which would allow geocoded data below the level of county. In a country without routinely available local morbidity information and in a locality where public perception of potential health risk is already heightened it is even more important that the licencing authority should satisfy itself that any extension of the facility :

- should prevent emissions which exceed accepted standards
- could prove that this is the case by appropriate monitoring and
- have contingencies in place to measure potential health effects in the event of excedances

For this reason the Department of Public Health has made the following recommendations to Limerick Co. Council and would hope that the IPPC licence could reflect this advice:

a) A dust control strategy which prevents emissions of dust from the site during construction, operation and post-decommissioning stages should be enforced and independently monitored.
b) A robust system of air quality monitoring should provide readily accessible information which can provide reassurance that emissions are at all times within accepted standards.
c) In the event of exceedances or events which may give rise to health concerns the company should be required to fund any studies that may be required on possible health impact.

Appendix 1

From: Davies, Peter G. (HPA) [ad1598@uwic.ac.uk]
Sent: 14 March 2006 14:03
To: Greally, Tessa
Cc: Russell, David (HPA); Coleman, Gary (HPA); Russell, Jeff (HPA); Huckle, Edwin (HPA)
Subject: Aughinish Aluminia Ltd

Further to our recent conversation concerning the above issue I can confirm that I have revisited the Environmental Impact Statement (EIS) covering the expansion of the Bauxite Residue Disposal Area (BRDA) due to the proposed increase in production capacity at the Aughinish Alumina plant.

I have also conducted a further search for information in relation health impacts from the disposal of "red mud" i.e. bauxite residue worldwide. You recall that I previously asked colleagues in NPIS to conduct such a search.

The proposal to expand the BRDA by a further 80ha from 104ha to 184ha & from 27m high to 32m together with upgrading the water management will extend the life of the facility up to 2025 from the current predicted cessation in 2009. This increased storage capacity will enable the plant to increase production of aluminium from 1.6mtpa to 1.95mtpa.

The residues to be deposited at the proposed Phase 2 BRDA will include moist red mud, moist process sands and salt cake - these wastes are the by-products of the production of alumina from the bauxite ore. The red mud mainly comprises iron oxide (this gives it its red colour), aluminium oxide, titanium oxide, silica and other trace components. The aqueous solution entrained in the mud and sand contains residual caustic from the refining process and it is this which gives the red mud its elevated pH which is an environmental issue should it seep into water courses. The other waste product is salt cake which consists of organic degradation products from humates in the bauxite. The Red Mud is classified as non-hazardous whilst the salt cake is classified as hazardous, due to the presence of oxalates and is deposited in a specially engineered cell.

Bauxite exhibits natural radioactivity, slightly above the average ambient level and according to the Radiological Institute of Ireland which has surveyed the site, the BRDA does not present a radiation hazard either to site operatives, visitors or the surrounding environment.

There are obvious environmental risks from the deposit of such vast quantities of this waste material in slurry form, which are mainly associated with migration of effluent into nearby watercourses i.e. the discharge of effluent into the Shannon and estuarine waters surrounding the site. This has been addressed in the EIS and a water management regime is in place which is intended to ensure that there is no adverse impact to water quality. There is also a risk to potable supplies from run-off from the BRDA as the Limerick County Water Treatment Plant will be located adjacent to the site, but again this issue has been addressed in the EIS and it is stated that precautions will be taken to safeguard water quality from contaminated run-off. The greatest potential risk to human health from the BRDA would appear to be the generation of airborne dust particles, which due to the refining process, can be less than 10 microns in diameter when the deposited red mud and salt cake is allowed to dry out. The bauxite residue is deposited on the site in a slurry form and as such the question of airborne dust does not arise. It is only when the residue is allowed to dry out that theoretically dust could be generated either naturally through "wind whipping" caused by high wind speeds eroding exposed surfaces, or through vehicle movements over the dried out surface. This issue has also been addressed in the EIS and it is accepted that the impact on communities from dust will be the main issue during both the

construction and operational phases of the scheme. This is borne out by the responses to the consultation process as the majority of respondents express concern over the amount of red dust deposition taking place on land surrounding the site.

The BRDA will be subject to the Integrated Pollution Prevention and Control (IPPC) regime and the Landfill Directive 99/31/EC which allows stringent conditions to be imposed on the operation of the site together with appropriate levels of monitoring. In the case of airborne dust, both from the red mud and salt cake, the IPPC permit should specify that measures are taken to prevent the emission of dust from the site both during construction and operation. It is also a requirement of IPPC that the site must be operated in accordance with Best Available Technique (BAT) and the site operator is required to demonstrate that BAT for the suppression of dust is being employed. It is for the Regulator to ensure that the techniques being used on the site are the "best fit" in the particular circumstances. If the site is therefore properly regulated and adequate monitoring is put in place both inside and outside the site boundary, then the risk of airborne dust affecting the local environment should not be significant and the impact on health negligible.

With regard to the literature search for papers studying the effects on local communities from similar situations to that at Limerick, I can confirm that unfortunately even after the second such search, I have been unable to find anything which is relevant to the disposal of bauxite residue.

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18.08.05. cr

Ms. Annette Fitzgerald
Principal Environmental Health Officer
Second Floor
Ashbourne Business Park
Dock Road
Limerick

Re: Environmental Impact Statement for Aughinish Alumina.

Location: Aughinish Island, Askeaton, Co. Limerick.
Ref. No: 754

Dear Ms. Fitzgerald,

I am in receipt of an application for a review of the integrated pollution control licence for the above named facility. I have examined the attached documentation (parts of which are of a highly technical nature) and I have assessed the Environmental Impact Statement in so far as I am competent to do so. I also visited the site in question and discussed the proposal with Mr. Tom Hartney Principal engineer and with Mr Liam Fleming Environmental engineer at the facility.

The nature of the activity carried on at the facility can be summarised as follows.

1. The abstraction of aluminium oxide
2. The recovery and disposal of waste in the facility.

General

The plant employs 500 permanent employees and provides a further employment for 200 contractors. The plant has been operated since 1983 and current production of alumina is 1.6 million tonnes per annum. Production has steadily increased at the plant since 1993 and this new proposal is to increase the production capacity to 1.95 million tonnes per annum. As part of this expansion it is also proposed to increase the height of the existing bauxite residual disposal area as well as providing an extension to the disposal area.

It is also proposed to re-locate the salt cake disposal area to the new extension. The upgrade of the water management system, the storm water pond and liquid waste pond is also proposed.

The increase in production will see an increase in the production of Bauxite Residue and also because of the use of lower grade bauxite.

Process

The process activity (i.e. bauxite to alumina) carried out at the plant can be described as follows:

1. Preparation

Bauxite is crushed and ground and then mixed with caustic soda. This mix is then transferred to digester pressure vessels.

2. Digestion

Under high pressure and heat the alumina in the mix is dissolved by the caustic soda and combines with the caustic soda to produce sodium aluminate.

3. Clarification

The solid residues (i.e. red mud and process sand) in the digested bauxite slurry are separated by settlement of the sodium aluminate solution. The residues are washed and the red mud is thickened by vacuum filtration and pumped to the bauxite residue disposal area.

4. Precipitation

The sodium aluminate is cooled and is agitated and seeded with aluminium crystals which in turn form larger crystals which gradually settle out of solution.

5. Calcination

The aluminium hydroxide crystals are calcined at over 1100°C to remove the water and a fine white powder is produced i.e. aluminium oxide.

Process Waste

It is stated in the EIS that most of the waste deposited in the bauxite residue disposal area are classified as non-hazardous.

The aqueous solution within the red mud and sand contain a small amount of residual dissolved caustic (sodium hydroxide) and alumina. Exposed to air most of this caustic converts to sodium carbonate and sodium bicarbonate.

The salt cake consists of sodium hydroxide aluminium oxide, sodium carbonate, sodium sulphate and sodium oxalate. This cake is classified as hazardous and therefore is deposited in a specially engineered cell within the bauxite residual disposal area.

In relation to the radiation levels the EIS states that the Radiological Protection Institute of Ireland have assessed the site and concluded that the naturally occurring radioactive materials used in the process are in compliance with safe levels as outlined in Radiological Protection Act 1991.

Matters of Public Health Significances

The main areas which are of concern from a public health viewpoint are

- Atmospheric Emissions
- Odour
- Noise
- Dust
- Water discharges and drainage

Atmospheric Emissions

The main emissions from the plant are from the boilers and the calciner. There are three existing boilers fuelled by heavy fuel oil. All three boilers flues are emitted through one stack.

The calciner stack is also made up of three flues. All emission points are monitored i.e. $S0_2$ and $N0_2$ and particulate matter in the case of the heavy fuel oil boilers and in addition to the IPC licence parameters measurement of sodium dioxide and odour is also carried out. The commissioning at the end of 2005 of the combined heat and power plant (gas fired) will greatly reduce the operation of the boilers and emissions there from.

Sulphur Dioxide and Nitrogen Dioxide and dust were monitored at 10 points located at areas around the plant and also at nearby sensitive locations, as well as Foynes Harbour.

The results of the baseline study showed the highest concentrations for each parameter as follows:

$S0_2$ Western boundary of the Bauxite residual storage area – 3.4 µg/m^3
EU Limit Value EU Directive 1999 / 30/EC as an annual average 20 µg/m^3

$N0_2$ Foynes Harbour – 7.84 µg/m^3
Northern boundary of the Bauxite residual storage area --- 7.26µg/m^3
EU Limit Value EC Directive 1999 / 30 /EC as an annual average – 40ug/m^3
It would appear in the Foynes Harbour case that motor vehicle exhausts in the harbour area would be the main source for NO_2

Dust Northern boundary of the Bauxite residual storage areas – 238.9 µg/m$^{3/}$day
TA luft Guidelines – 350 µg/m^3 day.

It is stated in the EIS that the predicted ground level concentrations as a result of maximum operation of the existing and proposed plant indicate that all levels will be within the appropriate air quality limits for the protection of human health.

The projected worst case scenario ground level concentrations are less than 14% of the $N0_2$ limits and less than 65% of the $S0_2$ limits outlined in the National Air Quality Regulations (SI 271 of 2002).
On examination of records at the plant I found that there were less than ten complaints logged in the complaints register for the year 2004. The majority of these complaints were atmospheric related.

Odour

An assessment of the odours at Aughinish was carried out in 2004. The report indicated that the boiler and cooling towers emit low odour concentrations.

The greater concentration of odour was detected in the mill extract vent, calciner pressure release tank but in particular from the flash tanks.

Land spreading of sludge has a potential to cause odour as does the removal and deposition of ponds cleanout sludge. Aeration of sludge to remove potential anaerobic conditions will be employed. At the time of my visit I could detect a hydrogen sulphide type odour at the bank of the storm water pond but this appeared to be localised.

Noise

Aughinish alumina is limited by its extensive IPC licence to noise levels at noise sensitive locations set out by the Environmental Protection Agency as follows:

- Daytime - 55 dB LAeq
- Night - 45 dB LAeq

Noise sources are mainly generated from materials handling systems, crushing and grinding systems, site traffic, sprinklers, pumps etc. and will have a negative impact on noise levels.

The EIS does not envisaged that the extension of the bauxite residual disposal area will significantly impact on noise during its operational stage. However, there is potential for an increase in noise level during site preparation and construction especially during blasting operations.

Dust

As well as existing potential sources of dust i.e. bauxite loading, transfer and crushing alumina hydrate storage, alumina loading, general traffic, chimney stacks and existing bauxite residual storage area there is potential for dust from the phase 2 bauxite residual disposal area. It is stated on the EIS that all red mud and associated access roads will be kept moist at all times and in particular during summertime and extreme winter frosts.

Sprinklers will be incorporated into the proposed development similar to the existing arrangement.
A dust control strategy, where an assessment of the likelihood of dusting (i.e. weather forecast bulletins, conditions of the mud etc) will be made and mitigation measures taken when necessary.

Water Discharges & Drainage

Rainwater falling on buildings, roads and hard standing areas is collected and mixed with process wastewater. A comprehensive effluent treatment system is in place to collect and treat the various process waste water.

The additions to the plant required for the increase in production could potentially effect the drainage system and same has been assessed.

The existing Phase 1 bauxite residue storage area has an area of 100 ha approximately. The proposed development of Phase 2 will increase the total area to 184 ha approximately, and therefore the runoff and storage will increase. It is stated in the EIS that the stormwater pond and perimeter interceptor channel should at least be equal to the future operating volume and the flood storage requirements.

The existing storm-water pond will be raised and will be designated to receive effluent from Phase 1 and 2 of the bauxite residual storage area. A spillway will be installed on the surface of water pond and this will be designed to re-divert effluent back into the perimeter interceptor channel in order to ensure that no effluent enters any water course. No sludges entering the perimeter channel or from the cleanout of the disused sludge pond will be allowed to exit into the nearby water course.

Due to the increased volume of surface water at the bauxite residual storage area there is a risk that additional seepage of contaminated water to groundwater will occur. Mitigation measures are to include composite lining of the area with high density polyethylene together with glacial till on the channel side slopes and glacial till over a geosynthetic clay liner over the base.
The storm water pond also needs to be refurbished by providing a composite lining.

The increased production, slurry transfer and increased concentration of the circulating caustic soda could potentially increase the level of groundwater contamination beneath the site. There is a groundwater Management strategy in place, incorporating prevention, containment and recovery. There is also a network of groundwater wells located at the facility to monitor groundwater quality.

General Comment

The submission received in the Environmental Impact statement states that emissions as a result of the increased capacity are expected to remain largely unchanged. However it would appear obvious that increased productivity will result in increased emissions at the facility and therefore it is essential that all emissions are kept within accepted parameters. Apart from the bauxite residual disposal area extension no further works or physical developments are required.

The construction period may be problematic in that rockfill will have to be transported from the nearby Borrigone Quarry. Earth-movement and construction work will give rise to dust. Noise and vibration from excavations, blasting construction traffic etc. may also occur.

Recommendations

In the interest of Public Health I would make the following recommendations on the proposal.

Construction Stage

The applicant (i.e. Aughinigh Alumina Ltd.) must take all precautions during the construction stage to ensure that there is no adverse effect or negative impact created by way of atmospheric emissions, dust creation, noise or vibration nuisance from the works being undertaken. Due care must be taken during the extension of the bauxite residual storage area, re lining of the storm water pond, and the re-location of the salt cake area and all necessary steps must be taken to reduce the risk of groundwater and surface water contamination.

Operational Stage

Applicant must ensure that all atmospheric emissions from the facility are such that they do not pose a risk to public health and are in compliance with the requirements of the conditions laid down by the Environmental Protection agency.

Extensive monitoring of PM_{10} and $PM_{2.5}$ should be carried out at the plant downwind from the prevailing winds to determine the impact of the increased production activities on the athmosphere and also to determine if mitigation measures are required.

Sources of fugitive dust emissions must be eliminated as much as possible.

Applicant must ensure that all wastewater created from the facility is treated in such a manner as to comply with the requirements of the conditions laid down by the Environmental Protection Agency and discharge in such a manner as not to be prejudiced to Public Health.

All necessary steps must be taken to prevent accidental spillages and seepage so as to prevent contamination of groundwater and adjacent surface waters.

All steps must be taken to ensure that noise nuisance is not created at the facility and in such a manner as to be within the limits specified in the IPC licence at all noise sensitive locations .

The applicant must ensure that mitigation measured are employed for areas within the facility that may have potential to create odour nuisance. An odour monitoring programme should be carried out by a specialist company to monitor and record odours at the perimeter of the facility and at other strategic areas outside the plant.

It is imperative that the construction and operation of the proposed facility does not pose an adverse risk to water stored at the nearby Co Council water treatment plant (ie. The Shannon Estuary supply).

Signed: _____

Andrew Curtin
Senior Environmental Health Officer

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Health Service Executive

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24.12.06. cr

Ms. Annette Fitzgerald
Principal Environmental Health Officer
Second Floor
Ashbourne Business Park
Dock Road
Limerick

Re: Further Information Submission on the Application for an extension to the Bauxite proposed storage area relocation of salt cake. Retention of existing Alumina capacity and permission for increase in existing alumina production capacity.

Location: Aughinish Alumina Ltd.
Ref. No: 06/754

Dear Ms. Fitzgerald,

I refer to the further information submission received from Limerick Co. Council on the 13/01/06 for the above application. I have already reported on this application on the 31.08.05 as a response to an application made by the company for an Integrated Pollution Control Licence.

Much of the further information submission is of a highly technical nature and I have examined the application in so far as I am competent to do so.

I attach a copy of my original report which is still pertinent to this application. I note the issues raised by the Planning department and the corresponding responses from Aughinish Alumina in their submission.

I would again reiterate that the construction, and operation of the plant be carried out in such a manner as not to be prejudicial to Public Health.

All levels of noise, vibration, dust, odour, atmospheric emissions, aqueous emissions etc. must not exceed the limits specified by the conditions set out in the Integrated Pollution Control Licence issued by the Environmental Protection Agency and must not pose a risk to Public Health.

I would point out that the protection of the nearby Limerick Co. Council Water Treatment plant from fugitive emission (mainly dust) from the operation of the plant and in particular from the operation of the Phase 2 Bauxite residual disposal area has been queried by Limerick Co. Council in the further information request sent to Aughinish Alumina.

This is a concern which was raised in my original report on the application. The response from Aughinish Alumina to Limerick Co. Council states there will be a predicted increase in ground level concentration of dust but will remain within the relevant assessment criteria. This is due to the increased proximity of the proposed bauxite residual disposal area to the water treatment plant. Furthermore a risk assessment will be undertaken at the water treatment plant for dust deposition.

Risk assessment and continuous monitoring must be carried out at the treatment plant to ensure that a risk of contamination to the water supply does not occur and also to prompt adequate mitigation measures to eliminate the risk of contamination.

Adequate independent monitoring of all environmental parameters (dust, surface water quality etc.) must be carried out while the plant is operational and following the decommissioning of the plant and must be kept in place until the requirements of the Environmental Protection Agency Integrated Pollution Control Licence conditions have been met.

Signed:

Andrew Curtin
Senior Environmental Health Officer