Land Quality: Demonstrating Projects and Delicensing

SAFESPUR members' Report No. E10404

Report of a workshop organised by Safespur held at eOffice Birmingham, Norfolk House, Smallbrook Queensway, Birmingham on the 14th October 2010

Speakers	Dr Robert Sweeney	CL:AIRE
	Mr Mark Hill	DEFENCE ESTATES
	Mr Stuart Johnson	HEALTH & SAFETY EXECUTIVE
	Mr Paul Atyeo	RESEARCH SITE RESTORATION Ltd.
Chairman	Dr Andy Thomas	FUTURE SOLUTIONS

The SAFESPUR meeting was held jointly with the SAFEGROUNDS learning network and gave delegates the opportunity to hear the latest developments in the delicensing of nuclear sites as well as a look into a number of demonstration projects, including an insight into how the MOD (Ministry of Defence) undertake land management.

Andy Thomas of Future Solutions chaired the meeting. The meeting was undertaken in an afternoon session which included presentations from four speakers, and opened with a presentation which updated the delegates on the progress and developments of projects that are involved with CL:AIRE (Contaminated Land –Application in Real Environments). This also covered updates to the sustainable remediation initiative, SuRF-UK. This was followed by an insight into how the Defence Estate deals with Land Quality issues on their numerous hectares of estate. The next presentation informed the delegates of the process of NII (Nuclear Installations Inspectorate) delicensing of sites from the point of view of the Health and Safety Executive, and portrayed case studies of sites that were following the process in commendable a manner. This highlighted to the delegates that delicensing is possible with the right attitude, and the following of stringent but fair procedures.

The final presentation continued on the subject of delicensing of sites, and gave an overview of a case study site at Harwell, where it had been successful. The success had been achieved through a thorough investigation followed by a remediation strategy that has been accepted as sufficient by the Health and Safety Executive NII. After each presentation there was a question and answer session which enabled discussions between both the speakers and delegates and gave the opportunity to share their experiences and concerns with the presentation topics.

INTRODUCTION

The chair of the meeting opened the session by highlighting the topics that would be covered. These topics outline a handful of demonstration projects with radiological and non-radiological contamination issues and which show a focused management of land. The process of delicensing currently licensed sites was also covered and was supported by a number of case studies and experiences.

For background information, the preventing of contamination of ground and groundwater, is the first rule in protecting land quality. However, despite this leaks and spills are not always able to be avoided. The history of these has lead to the contamination of ground and groundwater with radioactive and non-radioactive substances at levels above the natural background levels of the area. SAFEGROUNDS "Good practice guidance for the management of contaminated land on nuclear and defence sites" version 2 (LMGv2), sets out an approach and process for land quality management on nuclear-licensed sites. In addition learning from land quality and remediation projects from inside and outside the industry, enables the sharing of good practices and learned lessons from other peers, which can reduce the risk of mistakes occurring again.

There are two aspects to focused land management and these include the management of non-radiological, and the management of radiologically contaminated sites. Within this afternoon session the non-radiological aspects were discussed in relation to defence sites and the CL:AIRE projects. Radiological aspects within this SAFESPUR event looked into the topic of delicensing. Delicensing has two areas which were considered, in order to increase clarity and these are; that it should be thought of as the ultimate end game of any licensed site during licensing, and to increase clarity of the process in order to abolish the view that decommissioning of a site is always problematic and difficult.

LEARNING POINTS

1. CL:AIRE is a 'not for profit' organisation which was set up by the government and SAGTA in 1999 with the objectives of raising awareness and confidence in practical and sustainable remediation technology.

2. CL:AIRE currently is working alongside other organisations in order to undertake research and development on remediation technologies. Upon completion of the research projects, they will report findings, so that the results and lessons learned can be passed on to the industry.

3. Some technologies that CL:AIRE has undertaken work on include, Soil Vapour Extraction technology with thermal enhancement, Permeable Reactive Barriers and the use of Arvia® process of adsorption with electrochemical regeneration.

4. Defence Estates (part of the Ministry of Defence) uses the Safegrounds key principles and supporting guidance to deliver a flexible framework within which to assess and manage land quality.

5. Stakeholders are a key factor in all contaminated land sites and this is reiterated by Defence Estates. Key stakeholders depend on the site location and size and can be the communities affected, adjacent land owners and local authorities. Good communication with the stakeholders is key in achieving the overall project objectives.

6. The MOD are having to react to increasingly stringent regulatory regimes for sites subjected to contamination by Explosive Ordnance and Munitions. This is adding increasing pressure on the training estates. US technology is being adapted to aid the MOD in their prediction in where happens munitions are used.

7. Delicensing should be the overall end game of all licensed nuclear sites. The mechanisms for which alterations to a licence can be accepted include; relicense to change the site operator, obtain a variation for part of the site and to revocate or surrender the site license. However, to surrender a license does not mean that the period of responsibility is over for licensee.

8. The crucial element of a successful delicensing strategy is to work together with the HSE, and make sure that there is an open and honest relationship between all parties to ensure no nasty surprises make themselves known, which could delay the process.

9. A delicensing case which should be provided to the HSE includes the identification of the new site boundary, an explanation of how to control access to the remaining licensed site and the delicensing levels and criteria with a demonstration that this criterion has been met.

10. Good record keeping is key to all sites where contamination is likely to be an issue of the future. Good records help to provide information that can be used to build a remediation strategy.

ROB SWEENEY, CL:AIRE
CL:AIRE remediation projects and the sustainable remediation initiative, SuRF-UK

- Senior Project Manager at CL:AIRE
- 9 years experience in contaminated land and remediation
- His roles involve the management of a number of remediation technology demonstration and research projects

The focus of the presentation is primarily to introduce CL:AIRE and what the organisation does, and to identify which type of projects are interesting to CL:AIRE. This preceded a discussion of, a number of contaminated land examples that are currently being, or finished have being undertaken with other organisations. The presentation finished by updating the delegates on the SuRF-UK initiative.

CL:AIRE was set up as a 'not for profit' organisation by the government and SAGTA in 1999 with the objectives of raising awareness and confidence in practical and sustainable remediation technologies and for monitoring & investigation methods. This involves assimilating interest in new technologies, defining to the industry what has worked and what does not work and to distribute the findings to the whole contaminated land community.

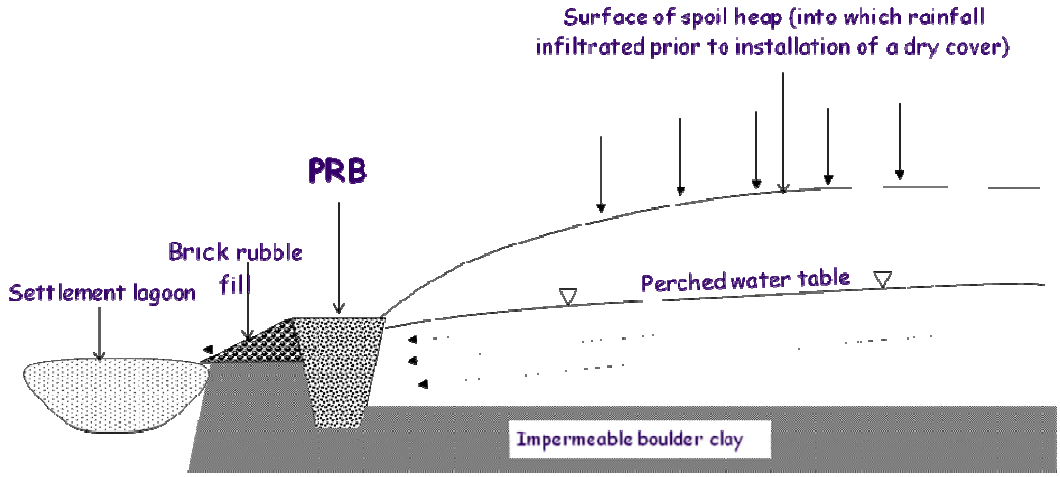
When deciding on future projects in which CL:AIRE will become involved in, there is a review process undertaken by a dedicated technology and research steering group (the TRG). As part of this process, the project group are primarily interested in projects which have a competent project management system in place, and ones which have a sound scientific background. It also requires a good methodology with the ability to add value in the UK's contaminated land market place. The TRG is made up of a wide variety of experienced personnel from industry and educational backgrounds.

The first of four case studies to be discussed was project TDP24 – Western Storage Area at Harwell – a site which has a history of RAF activities and nuclear research and development. The latter has occurred for over 40 years. However, since the mid 1990's the focus has been turned to decommissioning the site for redevelopment. The technique of interest is that of thermally enhanced soil vapour extraction which is used to remediate the unsaturated soil. The specialist contractor undertaking the works was Provectus Group (formerly AIG). At this site, pits were excavated to allow for the removal of chlorinated solvents and other chemicals, but a residual suite of VOC's and hydrocarbons were left in the top 25m bgl of unsaturated chalk, and this required treating. In order for this to happen pilot trials were undertaken and the best solution was chosen. This solution was to use SVE (Soil Vapour Extraction) technology with thermal enhancement in the areas of gross contamination.

In more detail the method involved using conductive heating with vacuum vapour extraction simultaneously. The heating system reached temperatures of between 500 and 800 degrees centigrade which is capable of heating the soil to temperatures of between 100 and 350 degrees centigrade. The technology was found to work on this site and the remediation was deemed a success. The product was being removed at a much faster rate than previous and it is estimated that 1 tonne of contaminants were removed. For more information on this project, the full report is available on the CL:AIRE website.

Moving on, the next case study talked about was, TDP13 –Shilbottle Spoil Heap in Northumberland – which has the label of having one of the worst spoil leachates in the UK. The project here is focused on treating the leachate that is flowing from perched water into the nearby stream at various locations across a 200m stretch. The solution was to install a (PRB) Permeable Reactive Barrier which is designed to intercept the groundwater flow. This solution was chosen as the best solution due to the length of area affected. The PBR design (FIGURE 1) was based on testing results of materials which best suit the problem, and was finally made up of 25% composted horse manure, 25% green waste compost and 50% limestone gravel. The PBR was not capable of removing some of the contamination such as the metals and so brick rubble, settlement lagoons and reed beds were also included in to the final design.

FIGURE 1 ("Presented at the CL:AIRE/FIRSTFARADAY Conference 2005 by Adam Jarvis, Newcastle University")



The results of this remediation were promising as they showed over 90% reduction in iron and aluminium and also a decrease in the acidity of the groundwater. It is also suggested that the cost of a passive system such as this is cheaper than active systems. The report for this is available on the CL:AIRE website.

Next up, TPD25 was explained – The creation of a design aid for innovation in in-situ multi contaminated groundwater – that was undertaken by a coalition of Worley Parsons, Imperial College London, National Grid Property Ltd, Environment Agency and Bradford City Council. A former gas works site was chosen for the location of a testing facility, where the experimental trials could be undertaken. The experiments involved testing the performance of various (three) oxidation technologies in the field. These were catalysed hydrogen peroxide, Sodium persulphate, enhanced bioremediation (gPRO) and finally 'control'. The results were analysed, and the results support the formulation of a decision making framework. The catalysed hydrogen peroxide had a one day life span and the sodium persulphate had a three day lifespan in the ground. It was found that a rapid breakthrough of oxidants occurred during the testing. In addition they led to a lowering of the pH and this was more pronounced in the sodium persulphate trial. gPro trials showed that optimum conditions for aerobic degradation were not achieved due to an excess oxygen demand.

The outcomes of the modelling were that hydraulic fracturing is important in the efficient delivery of oxidant and so a new model of hydraulic fracturing has been developed in addition to a decision support tool that is in excel format. The design support tool will be made available on the CL:AIRE website later this year.

The final case study was TDP31 - Demonstration of the Arvia® process of adsorption coupled with electrochemical regeneration for the on site, ex-situ, decomposition of organic contaminants in groundwater. The technology is based on adsorption by Nyex® material and treatment unit where adsorption, and electrochemical regeneration can be achieved. The process in plain terms is of adsortion, sedimentation and electrochemical destruction. The technology was tested on two sites (a former agrochemical facility and a petrol station site) and the results have yet to be reviewed by CL:AIRE, but it is claimed that they are impressive and the final report is due by the end of 2010.

This presentation then focused on the SuRF-UK initiative which has been running since 2007 and is a UK based collaboration of regulators, industry, academics and consultants which are working consistently with UK regulations. The forum has a steering committee and two main goals, which are to set a framework for assessing sustainable remediation and to provide a sustainability indicator review. The term sustainable remediation is described as "the practice of demonstrating, in terms of environment, economic and social indicators, that the benefit of undertaking remediation is greater that its impact and that the optimum remediation solution

is selected through the use of a balanced decision making process" by SuRF-UK. There are multiple key principles set by the forum which all aim at optimising risk-management based on consideration of social, environmental and economic factors.

A framework document is available and was published in March 2010 and has two stages which a project can be affected by. Stage A is during project planning and design whilst Stage B is during the remediation implementation. The Phase 2 of SuRF-UK is to trial the framework and has a deadline of April 2011 which will allow the document to evolve. A Defra funded research project which applies the SuRF-UK indicators will be released by the end of the year.

As a closing statement, it is highlighted to the reader that CL:AIRE are always on the lookout for new demonstration & research projects & industry initiatives to become involved with.

At the end of the presentation Rob looked to the floor for comments and questions. Chris Gilbert (Golder Associates Ltd) added that he had worked with Arvia® and commended its ability to deal with Solvents and dealing with orphan waste. Colin Rogers (Greenworld Trust) highlighted that there is problems with marine sites, clean up and pH levels in the coastal areas. It was noted that the University of Southampton are involved with marine contamination research. Peter Booth (National Nuclear Laboratory) asked how can CL:AIRE get more radiological sites on their projects, and Rob Sweeney answered that they are in contact with some organisations, but the nature of the contamination makes timescales, too long and unworkable.

MARK HILL, DEFENCE ESTATES
Land Quality and the Defence Estate

- Head Environmental Liability Management Group
- Very influential personnel to the Safegrounds learning network over the years

The presentation opened by setting the scene in terms of the scale of the MoD (Ministry of Defence) Estate. The area of land covered and the diverse nature of the estate creates a unique challenge within the modest budget available to assess and manage land quality. For instance the estate in the UK comprises some 240,000 hectares of land, 45,000 buildings, 129 SSSIs as well as a number training areas. In addition there are overseas elements to the estate in places such as: Gibraltar, Cyprus and the Falklands. Mark then went onto set out the key challenges not least of all the perception that all MoD sites are contaminated with a plethora of contaminants as well as unexploded ordnance such that they can be blighted by association, A situation that can be compounded by a perception of secrecy and the fact that record keeping over the years has not always been as comprehensive as it could. However, MoD is in fact committed to openness and transparency when it comes to managing environmental issues including land contamination and the SAFEGROUNDS (SAFety and Environmental Guidance for the Remediation of contaminated land on UK Nuclear and Defence Sites) key principles and supporting guidance have proven useful in achieving this.

The commitment to sustainability makes the assessment and management of land quality an important issue for the MoD and in particular DE The SAFEGROUNDS key principles and guidance provide a flexible, transparent framework within which to prioritise, assess and manage land contamination, allowing available resources to be focussed in the most effective manner whilst being protective of human health and the environment. The MoD use a phased land quality assessment or LQA approach which targets the high priority sites first and a crucial element of the work is the involvement of stakeholders. The level of involvement of key stakeholders depends on the situation, but can include local communities, adjacent landowners and local authorities to mention but a few. The framework provided by the SAFEGROUNDS key principles and guidance lends itself to stakeholder involvement and the Learning Network is particularly useful in facilitating the exchange of knowledge and the development of good practice for the management of radioactively and chemically contaminated land on nuclear and defence sites in the UK. As mentioned DE has found that the framework provided by the key principles and guidance allows for a consistent yet flexible approach which is will protect human health and the environment. The aim being to establish

and follow good practice such that land contamination is managed appropriately, taking into account the needs and views of stakeholders and sites are released safely for sale and redevelopment.

In addition to a programme of land quality assessment, the MoD is also being increasing proactive in minimising the environmental impact of its activities. For instance work is proceeding on identifying the environmental impact of munitions to inform procurement and use on the training estate. The process of assessing the environmental affects of munitions uses the Project Orientated Environment Management System (POEMS) as a foundation.

The importance of record retention on sites has been reiterated and a Land Condition File has been trialled and is to be rolled out across the estate. The intent being to ensure that reports etc are not forgotten and sites are aware of the presence, nature and extent of land contamination and the associated hazards. In this way the potential for duplicating work and compromising earlier remediation work will be further minimised. DE has also set up an LQA database which is a GIS based system that links all documents and investigative information together on a site specific basis.

The final comments highlighted the MoD's commitment to making sure sites are safe. It is the intension that all land quality information will be published and hopefully used to aid SAFEGROUNDS in the future. It was also highlighted that stakeholder relationships are very important in their work as to, is the commitment to sustainable development.

In the question and answer session after the presentation, David Collier (Golder Associates Ltd) asked how do the MOD prioritise their vast amount of sites? The answer highlighted that this was done using a strategic Phase O LQA methodology to identify the priority sites and inform where further LQA is required. That said the prioritisation is revisited as information becomes available. In the case of sites scheduled for sale, then they will be subject to LQA as a matter of course. The next question was, how do you identify the appropriate stakeholders? It was answered that this is a challenge and something that you don't always get right first time. The starting point is to identify a local contact and sit down with the regulatory authorities and work from there identifying the individuals and groups that need to be involved. The final question, was do all sites have an allocated liaison person and the answer to this was not necessarily. There are individuals who are responsible for environmental issues but there may not be a designated liaison person per se.

STUART JOHNSON, HSE NII DELICENSING
HM Inspector of Nuclear Installations

- 2 years of working with the Health and Safety Executive
- 25 Years of working within the industry inclusive of 13 high hazard sites

The presentation covered the topic of licensing and delicensing of nuclear sites. It looked at the regulatory approach and then presented an example of where delicensing was occurring with success. The NIA65 sets out the requirements for Licensing of nuclear sites and the aim of all sites is that they can be eventually delicensed. If a site follows procedures then it should be easier to obtain the end output of delicencing. The mechanisms, for which licensed nuclear sites maybe removed from licensing requirements are; relicensing to change the site operator, obtain a variation for part of the site and to, revocate or surrender the site license. If the license is surrendered then it is noted that the owner can not just walk away because it does not end the period of responsibility. This period of responsibility can therefore stipulate that liability can survive in place until the termination of the licence. For all the time the license is in place, it will require continued maintenance. The licence continues until "in the opinion of the HSE there has ceased to be any danger from ionising radiations from anything on the site (or part thereof)" or "a new nuclear licence in respect of the site is granted". In lame man terms site will start as Greenfield and will end as Greenfield after the licence is ended by the HSE.

Once the HSE is satisfied that there is no danger from ionising radiations from anything on site to current and foreseeable land uses, then they can end the period of responsibility.

When considering the term ‘no danger’, the HSE quantifies it as the level at which the site is indistinguishable from the background radiation, and that there is a risk level of less than 1 death in a million per year. This is ‘broadly acceptable’ by the HSE. This statement of no danger was published in 2005. Further guidance for delicencing is available at www.hse.gov.uk/nuclear/delicenceguide.pdf.

The HSE guidance recommends using the values set out in RS-G-1.7 ‘Application of the concepts of exclusion, exception and clearance’, although licensees are free to develop their own criteria to meet policy, but they must be justified to the HSE.

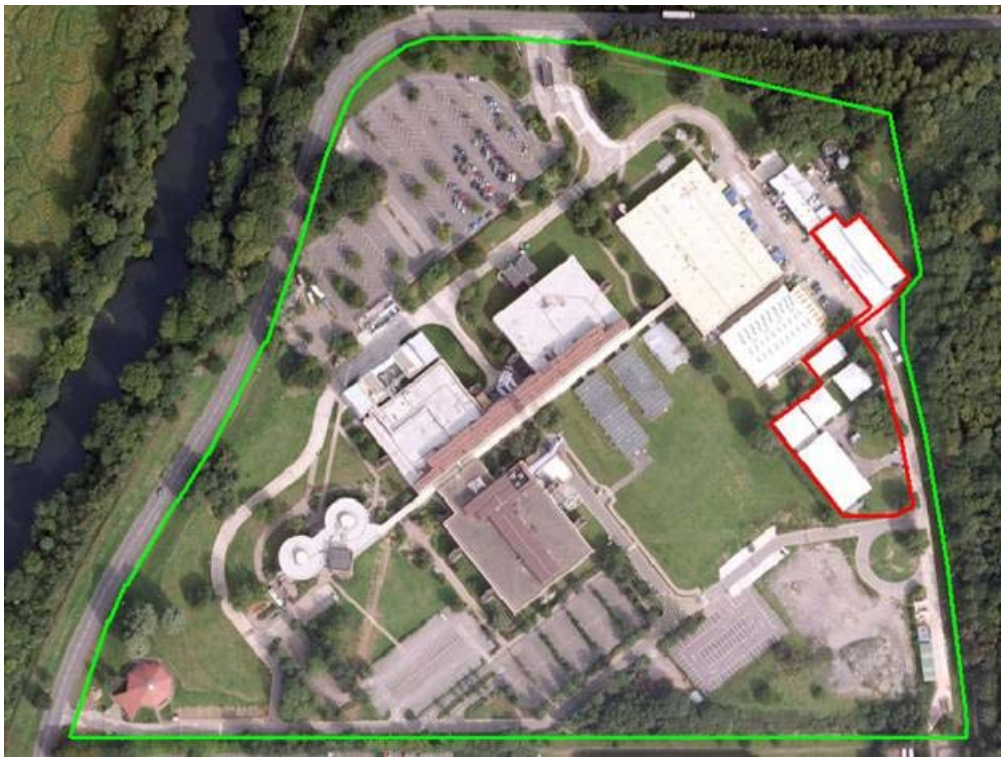
The regulatory approach requires that the licensee’s application is supported by a safety case which includes; the reason for delicence, history of the site, use of the land, buildings, identification and assessment of radioactivity within the area concerned. This is to be in conjunction with an assessment of dosage and the risk to the public following delicencing. It shall also state how the disposal and management of radioactive waste will be carried out in line with current regulations. Older sites are generally more complicated due to poor record keeping. In addition the HSE requires that the ALARP (As Low As Reasonably Practicable) requirements are considered and may require the justification that there are no more low cost clean up measures. These require the operators to ensure that risks to health and safety are reduced so far as is reasonably practicable, and the HSE expects that the overarching ALARP requirements are considered. The HSE, generally judges whether the operator has demonstrated that the ‘one in a million risk of fatality’ criterion is met by the material left on site.

Before the delicensing review can happen, evidence is reviewed which includes information on the historical use of the site/buildings, documents such as building surveys, historical events and incident logs. Sampling and monitoring analysis and assessment will also form an important part of the evidence. The data must build a case which will satisfy the solicitor’s advice which states that there is no provision to ignore anything on site. In addition an Independent survey is required to support the NII assessment of the safety case and supporting documents. Contracts are set up with the Health Protection Agency and this is not to replicate the licence but to check the process undertaken by it.

The crucial element of a successful delicence strategy is to work together with the HSE, and to make sure that there is an open and honest relationship which will reduce the risk of nasty surprises causing delays. If this is done then problems can be flushed out at an early stage. Examples of where delicensing has been successful have now occurred on many small sites including; Harwell Pilot Area, Scottish Universities (East Kilbride) and the Maynard Centre in Cardiff. The Harwell example is complex due to the size of the site and so delicencing is currently being undertaken in a section by section approach.

The Maynard Centre has been used by the HSE as a good example of the approach and method for applying for a licence variation. The site has a storage area which is close to the River Taff and so contamination needs to be well monitored. Figure 2 shows the extent of the variation. The site owners (GE Healthcare) would like to delicence all but the area shown in red.

FIGURE 2



The site is said, by the HSE, to be a well managed site with a good amount of funding to undertake the decontamination works. The site owners have submitted a 'Clearance in Principle' report and the HSE have responded with an 'Agreement in Principle' assessment. These assessments provide confirmation that the licensee strategy is acceptable. As part of the remedial process, buildings were cleared to the target standards. At the end of the site remediation, the licensee will submit a safety case which acts to request a variation to the nuclear site licence.

At this site the licensee set their own remediation targets using the RS-G-1.7, and opted to go for levels required to meet the HSE criterion. In addition to these requirements the NIA65, requires consultation with the Environment Agency and a review of whether re-contamination has occurred, and Maps/Plans to be produced of the new licensed site boundary and finally the retention of all site records. It is expected that as this remediation has progressed well and the HPA has concurred that the conclusions are correct, that the licensee will apply for the variation in 2011.

After the presentation, David Bennett (Environment Agency) asked if the HSE considers an alternative approach to the RS-G-17 guidelines, such as risk scenarios, likelihood of risks and probabilistic approaches. The answer was that this method is deterministic to try and avoid the very tenuous process of quantifying risk. Mike Pearl (UKAEA) added that some sites have small areas of waste left which would cost a lot to leave a licensing regime in place for years to come. The response was that it can be cheap, because the idea is to justify that the risk is lowered. Other comments mentioned that the contamination can be moved with Environment Agency approval. The final comment mentioned that the HSE do not find the capping of radiological contamination acceptable in the delicensing approach.

PAUL ATYEO

Progress with License Termination (Delicensing) of the UKAEA, Harwell site, UK

- **RSRL Decommissioning Project Manager**

The idea of this presentation was to portray a case study where delicencing of a site is currently being undertaken in a successful manner. The case study is the Harwell Site, which is located near Didcot in Oxfordshire and has been home to a former RAF airfield and early nuclear research laboratories and reactors. The original licensed site is 113 hectares. The end state of the site for Harwell is to fully delicense the site, and this will be undertaken using a phased approach which involves separating the site into several separate areas, four of which were discussed at the presentation. Each square metre of the site was to be filtered through the process of remediation in order to ensure it can meet the assessment criterion which is very tight. To date, two of the areas have been completed and the remaining two are underway.

The process for delicensing involved gathering historical information through interviews, survey records and maps/drawings of the site. This was before radiological and chemical surveys of the land were undertaken. The importance of existing drainage networks were highlighted as being an important factor in the consideration of remediation strategy. After the review, a delicensing case is submitted which included information about the boundary of the site, the clearance criteria used and a demonstration that the clearance levels have been met. The delicensing criteria for this project was based on the HSE policy issued in May 2005 which set a risk criteria and stated that no radioactive waste is to be left on site. The risk levels can be met by either demonstrating that activity levels are below that set in RS-G-1.7, or by carrying out a site specific risk assessment to demonstrate that the risk level is met.

A ‘delicensing case’ includes the identification of the new site boundary, control of access to the remaining licensed site, the delicensing levels and criteria, a demonstration that this criterion has been met and the emergency arrangements for the delicensed site. In addition a general sampling and surveying programme is undertaken including concrete sampling, ground sampling, trial pitting and dose monitoring.

One area of the site that has already been de-licensed is the Pilot Area (70000m^2) and this was discussed in more detail. The area has still got 6 buildings remaining out of 43 which provide an example that it is feasible to leave some buildings standing. There was a Trade waste drain running under the site and 10 buildings with radiological history. The building surveys included Alpha, beta and gamma surveys, and intrusive investigation of radiation anomalies. The land surveys included a Gamma survey on all open land, Alpha and Beta survey on selected areas, dose rate surveys and intrusive surveys. These were undertaken to a depth of up to 3.0m with 500 samples analysed. The site has also been remediated for other chemical contamination.

Work is also ongoing on the Eastern area which was home to the oldest reactor (GLEEP) in Europe which has now been decommissioned. This section of the site is behind the Pilot area in remediation but is close to gaining a decision on whether or not it can be delicensed. The site is approximately 5 hectares.

Sampling was undertaken during and after demolition using trial pits on grid spacing. During the investigation of the site, it was found that there were a number of large concrete basements which required discussions with NII to decide whether they needed removal. After the remedial works were undertaken, the area was found to be indistinguishable from background radiation. This is an example of working together with regulatory bodies.

In the North Gate Area, which is undergoing final delicensing surveys, the site work was complicated by a drain pipe (OMAD) which had to be dealt with during the remediation process because if it was left there could be an exposure risk in the future. There was also a trade waste drain which was at a lower risk and which has been tested, pressure washed and gamma surveyed and then proven to be acceptable (compliant with delicensing criteria) and so it was left in place after grouting.

The experience of Harwell has found that good record keeping is key, because accurate and reliable records make delicensing easier. Comprehensive decommissioning reports should also be undertaken as delicensing can take place many years after. The involvement of the delicensing team throughout the process is also identified as being useful. Lessons learned from the works so far include, that the demonstrating of negatives (i.e. drain is not there) is often necessary, there needs to be an attention to detail, keep good records and work with NII as far as is physically possible.

Trevor Jones (NUVIA) asked where was the groundwater sampling? And the response was that it was undertaken from a number of boreholes and groundwater locations. Colin Rogers (Greenworld Trust) questioned how it was known that the aquifer is not contaminated. The answer, was that there was a well developed understanding of the aquifer from contamination data and the hydrogeology was well known. The relatively large span between sample locations was queried and it was evident that this was only the case in clean areas of the site. The sample regime was much more rigorous for areas susceptible to higher risk.

This final question and answer session concluded the days presentations.

CHAIRMANS SUMMARY

The meeting was concluded by a closing statement from the chairman, which highlighted to the delegates that there were two aspects to this event. One being the non-radiological contamination and the, second being the subject of 'delicensing a radiological site'. It is found that there is a lot of opportunity for the transfer of new technologies to the industry via these types of forums and research agencies. It is also noted that with radioactive waste/contamination the contaminant can not be destroyed, which means that the best practice currently is to clean up the state of the material. This can be undertaken in an identical manner to that of dealing with non radiological contamination. It is also reiterated that the one major issue is with regards to the stakeholders. They are important in contaminated land and can lead to difficulties when undertaking the remediation of sites. Locating all stakeholders is also a major difficulty.

With regards to nuclear delicensing, the problems encountered appear to be with interpretation of what is required. Sustainability is also a big factor. There is a clear need for early engagement with regulators as it is a complex process that can not be carried out by an individual organisation. However, if it is well planned delicensing is very achievable as proven by a number of case studies. A final thought is that from the presentations, it is clear how important record keeping is on sites where contamination is likely to be an issue, whether its radiological or non-radiological.