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Avonmouth
Tritium Contaminated Building Remediation

Project Details

Project Ref: NS1040

Value: £800K

Programme: 12 months

Project Team: Project Manager, RPA, Health Physicist, RPS & Decommissioning Technicians

NSG Environmental Ltd undertook a programme of remediation works on a building (30m x 30m) that was heavily contaminated with Tritium (^{3}H) and Carbon 14 (^{14}C). The building was used by a company developing chemicals for research and pharmaceutical purposes, part of this work related to radiochemicals.

A fire took place at the end of 2003 in a radiochemistry laboratory in which a significant quantity of ^{3}H and a smaller quantity of ^{14}C was stored. Due to operational procedures designed for normal buildings, when the fire started the ventilation system shut down to prevent more air from feeding the fire. The immediate effects were limited to damage in that laboratory but smoke and discharges from the fire carried contamination to the remainder of the building.

The ventilation system was generally constructed from ABS and a lot of it was destroyed.

The Environmental Agency (EA) was informed of the situation, ARUP were called in as engineering consultants and a contracting company surveyed the contamination throughout the building. During the survey it was discovered that the fire allowed the ^{3}H and ^{14}C to migrate around the building into controlled and uncontrolled areas.

The building consisted of a ground and upper floor and that was approximately 70m square. The ^{3}H contamination penetrated most of the building structure, contents and fittings. Wooden items (doors etc) contained typically around 120 Bq/g ^{3}H, concrete block walls around 40 Bq/g, and plastics around 20 Bq/g, bodies of water (i.e. header tanks) contain around 100 Bq/g. In the radiochemistry laboratory activity levels were typically between 27 and 36kBq/g on and within the concrete wall structures.

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NSG provided a temporary ventilation system that augmented the exiting structure which included an in-stack sampling system that allowed the constant monitoring of the ^{3}H discharges. The technical solution delivered significant programme acceleration at an economical price. Once the ventilation regime was put in place, there was a reduction in the contamination levels via authorised discharges to the environment.

On completion of the ventilation system the scope of works was extended to include the site decommissioning. NSG subsequently installed a temporary electricity ring main to allow the continued safe decommissioning. A monitoring and sampling regime was set up using in house analysis capabilities (Liquid scintillation counting) backed up with by independent laboratory checks.

As the project progressed NSG conducted a series of BPEO studies to review the most appropriate waste routes. NSG liaised directly with the EA and suggested a cost effective waste route that utilised an exemption order primarily used for laboratory waste which allowed disposal to landfill.

The old ventilation stack was dismantled, removed and discharged via an authorised route.

NSG arranged for the existing uranium manifold containing ^{3}H to be sent the original supplier in Switzerland.

NSG initially soft stripped the building (paper, chairs and desks) by monitoring and segregating the waste, most of this waste was consigned to landfill under a VLLW authorisation issued under "The Radioactive Substances Act 1993."

During the characterisation of the waste we found that the tritium had penetrated the wood to such an extent that it was not suitable for landfill. Following simple development trials it was found that increasing the surface area along with heating caused the tritium to be gassed off. NSG scaled this process up for decommissioning utilising an industrial shredding unit, space heaters (non naked flame) and 50

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millimetre deep trays for storing the shredded waste under forced ventilation. The process proved extremely successful, the ventilation system discharged via the authorised route to the stack and the wood had a disposal route to landfill.

Extensive sampling also showed that there was a correlation between the levels of ^{3}H and ^{14}C contamination. This proved extremely beneficial as ^{14}C was used a 'tracer' to identify areas that were potential contaminated with ^{3}H.

After reviewing earlier papers and trials and we determined that the paint surface contained the majority of the ^{3}H. It was then agreed that the paint-coated steel was suitable for recycling, a decision which was applauded by the EA.

Throughout the project NSG endeavoured to minimise the volume of waste that needed to be consigned to Drigg, this realised significant project savings and also prevented the waste of a valuable natural resource.

Following the review of the impact to the environment all liquors from the decommissioning works were analysed and discharged to drain (the authorised route) with EA approval.

NSG produced an ALARP study to show that the building could not practically be decontaminated and on this basis all stakeholders agreed that the building should be demolished.

During this final phase NSG managed the demolition team and were responsible for monitoring all discharges and disposals off site.

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