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March 2018 marked the seven-year anniversary of the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident. This INES Level 7 event released an estimated 12 - 70 PBq of radioactive material into the surrounding environment. These contaminants consist of two primary radioisotopes of cesium. The radiocesium was found to strongly adsorb to the frayed-edge sites of clay minerals commonly found within soils. Once sorbed, it becomes extremely difficult to remove the cesium species from these active sites, even under harsh and unnatural chemical conditions. It was therefore concluded, that the transportation of these contaminants within the environment is controlled and facilitated by the movement of the host clay minerals within the environment.

Using the knowledge gained from the studies conducted prior to the FDNPP accident, the Japanese authorities have been extensively removing contaminated topsoil and organic matter from across the Fukushima Prefecture and placing into strong polymer bags with a volume of approximately one cubic meter. These bags are subsequently transported into specially designed 'Interim Storage Facilities (ISFs)', where they will be housed until the radioactive contaminants naturally decay back to safe levels. At present, there are a vast number of ISFs spread across the Fukushima Prefecture, currently housing an estimated of 30 million tons of contaminated material. Throughout their lifespan, including during construction, these sites require repeated monitoring to determine whether the attempt at isolating the material has been successful. These repeat monitoring investigations provide an excellent platform with which to test new and novel methods for radiation mapping, as well as the potential to explore improvements to the systems currently in place.

As part of a wider-scope research program, recent field investigations have focused upon using unmanned aerial vehicles (UAVs) and their derived products to improve and streamline the radiation mapping process for repeat site monitoring. In this investigation, UAV-derived airborne photogrammetry is used to produce three-dimensional (3D) digital surface models (DSMs) of two ISFs, at different stages of completion, within the Kawamata District of the Fukushima Prefecture. The processed 3D rendering of each site is subsequently combined with radiation data, collected through the traditional walking-survey method, to produce a very high-resolution (sub-meter scale) 3D radiation map. Given that the primary method of mobilization of adsorbed contaminants in this setting is through the physical transport of the sorbent, the incorporation of a DSM within the collected data creates the ability to relate the distribution of radiation to the surface hydrology by calculating the flow accumulation of the site. For both the completed, mature site and the site under-construction, the observed radiation distribution can be explained by the ingress of meteoric water, which is physically moving contaminated material across the site. However, this is perceived to be the product of two different explanations for each site. These 3D renderings combining surface water flow with radiation distribution to permit a better understanding and

prediction of material movement across an ISF Combining this with the ease of deployability and near-autonomous post-processing software options for photogrammetry, these techniques combine well to form a powerful analytical tool.