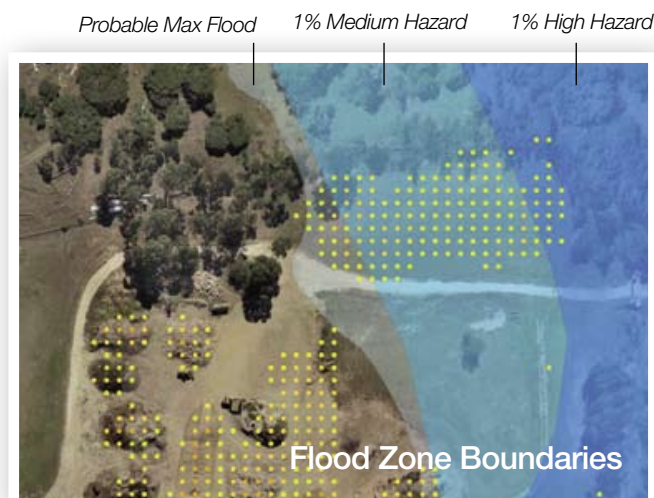


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Change Analysis – Landfill Investigation

Blacktown City Council in the fast-growing western suburbs of the Sydney Metropolitan area, has been dealing with the problems of unchecked and sometimes unauthorised landfill or excavation in the local government area. These activities change the drainage system and affect floodplain characteristics, which are of concern to engineers undertaking hydrologic/hydraulic modelling for flood studies and development planning.

A key concern is that the overall floodplain retention capacity is reduced and flood-levels become inaccurate. With a local government area of some 250 square kilometres, it is a difficult and time-consuming task to monitor and investigate landfill, dumping or excavation activities, most of which occurs on private land. It may be as simple as the landowner filling a watercourse to create a causeway for access to another part of the property, or it may be as significant as the excavation and fill resulting from major road building such as the Western Sydney Orbital (M7) that runs through Blacktown LGA and over many watercourses and drainage systems.



Desktop survey to categorise nature of DTM change. Orthophotographs, isopach analysis and Flood Risk Precinct layers are shown. Here stockpiles are clearly seen

LiDAR and Orthophotography

Blacktown City Council surveyors and engineers utilised an innovative approach for detecting and measuring landfill using LiDAR (also known as Airborne Laser Scanning) over different time periods. In 2001, an Airborne LiDAR survey was undertaken by AAM to create a base data set and digital terrain model (DTM). Extensive field survey was undertaken to verify the accuracy and ability of the LiDAR data to define the terrain surface, with particular emphasis along watercourses.

Aerial photography was also acquired to create a visual record at the same time, to support investigations and facilitate subsequent photogrammetric measurement of identified landfilling sites, and to calculate the volume and extent of fill or excavation.

In 2005, AAM undertook another LiDAR survey at the same acquisition specification, over exactly the same area, at exactly the same time of year. Aerial photography was again acquired for site inspection and investigation.

In 2006 this LiDAR survey was repeated for the entire LGA, thus creating the third successive set of surface data after the completion of the major road and engineering works in the M7 Motorway corridor and adjacent areas. Aerial photography was acquired again and high resolution 0.1m resolution colour orthophotography was produced for site inspection and investigation.

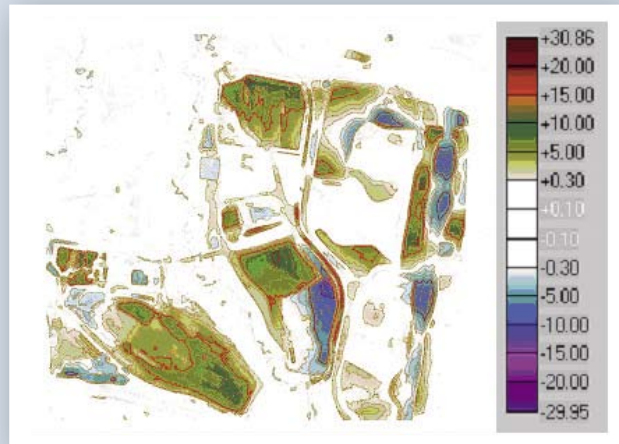


AAM and Blacktown City Council won the prestigious award for spatial science applied to Environmental Management

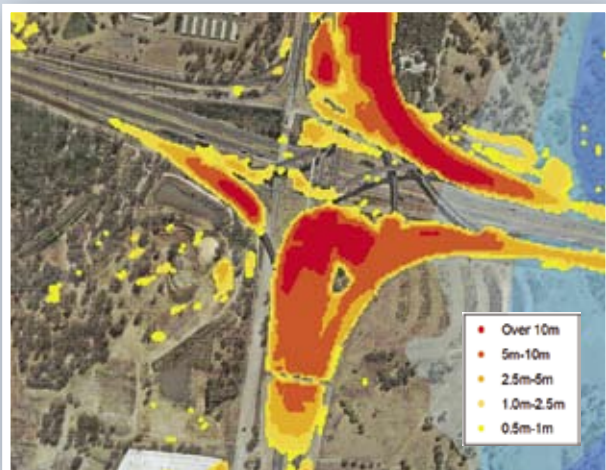
Isopach Analysis – Surface Change Detection

Isopach analysis involves the comparison of the two or more DTM's and mapping the differences as areas of variation, like a contour map or elevation model. The ranges of variation in elevation are graduated and are both positive and negative. AAM's Spatial Technologists devised the computational technique.

The change in the terrain surface is represented as a height above or below the 2001 derived surface. A vertical exclusion range was set to remove any systematic noise between the two data sets. Any change greater than this threshold is apparent in the GIS layer when integrated with roads and property boundaries, as well as digital orthophotography which provides the visual context of the surface change area.



Isopach Analysis results of the 2001 and 2005 DTM's displayed as a raster image



Isopach Analysis results of the 2001 and 2006 DTM's displayed with an attributed point value over the area



The changes are quite apparent as these contours show in the vicinity of the Lighthorse Interchange on the M4 & M7, but there are extensive changes due to other activities

This project demonstrated that surveying and spatial science technologies can be used to effectively measure, monitor and report the impact of unauthorised landfilling activities on floodplains over large areas. The project demonstrated that the methodology developed a fast and accurate means to assess potential sites. Useful and accurate evidence was gathered to support Council officer's claims for resolution and/or prosecution.

The LiDAR data has been used for many other Council activities. A DTM +0.5m contours was generated over the whole LGA.

This will improve the accuracy in modelling the extent of flooding zones along with planning of roads and drainage works, parkland reserve management, 3D modelling of built environments and other topographical and environmental studies.

AAM Client

