Flood mapping is used to communicate flood risk to the public and to control land development. Flood extents for large watercourses are defined based on hydraulic model results that typically require minimal filtering and appear reasonable to the community. However, inadequate filtering of results can become problematic for overland flow studies and models using direct rainfall in a 2D hydraulic model in urban areas, as the flood extents derived affect large numbers of small suburban properties unlike large watercourses in river valleys.

It may be desirable to develop a set of criteria to filter hydraulic model results within a council for council-wide adoption. Similarly, councils may seek to guide the development of their own criteria by investigating the criteria of other councils. However, study-specific criteria may also be beneficial, particularly to gain community acceptance or if the flood extents will be employed as the flood planning area.

In the case of Hornsby Shire Council, broadscale mapping was undertaken across the entire Local Government Area as part of an Overland Flow Flood Study completed by Cardno in 2010. The model used a 6 m grid and a rain on grid approach. The flood extents were filtered only to 0.15 m depth and above. The results of the flood study were released for public comment in November 2010. Many submissions were received with the majority objecting to the flood extents shown. As a result, Council decided to review the outcome of the study and undertook a number of detailed studies over the following years. In general, these studies confirmed the outcomes of the broadscale study but indicated that refinements to the presentation of the mapping of the flood extents were required to meet community expectations.

Council desired improved mapping to better define the flood planning area and to tag flood control lots. The objectives were to connect the areas on genuine flowpaths and deletes the areas of ponding that are not real flowpaths. The outcomes of the detailed studies were supplied to Cardno, which included a variety of modelling methods and study objectives. Together with Council’s in-house knowledge, the detailed study results formed the basis of refining the filtering criteria.

The flood extents were enhanced by adding a velocity depth filter (“or” parameter) and a larger area filter was applied (“and” parameter) to remove larger ponding areas. An optimal set of filtering criteria was achieved by comparing trial filter sets with the results of the detailed studies and then checking the proposed outcome against Council’s understanding.

During this process, the grid cell size was reduced from 6 m to 3 m to improve accuracy of the results, as the required computation time had reduced significantly over the previous 5 years. The resulting optimum velocity depth criteria increased (0.03 to 0.07 m²/s). Hence, grid size is one parameter that will impact the optimum filtering criteria. Smoothing was
also applied to the final results to achieve improved acceptance by the community. The filtered results are shown on the left compared to a detailed study on the right.

Two studies were completed concurrently by Cardno in the Canterbury Bankstown Local Government Area: the Cooks River Overland Flow Study and the Salt Pan Creek Overland Flow Study. The Salt Pan Creek study used TUFLOW as the hydraulic software with a 2 m grid cell size, while the Cooks River Overland Flow Study used SOBEK with a 3 m grid cell size. Both studies used the rain on grid method and required detailed consideration of results filtering. A depth filter of 0.15 m and above had been previously nominated for the study.

Detailed ground truthing was undertaken and formed the basis of the evaluation of filtering criteria. While many areas did not show a significant difference in the effects of filtering criteria, locations were selected specifically in order to differentiate the criteria sets. The image below shows one location that was used to select the optimum filter set. The optimum criteria to supplement the depth filter were chosen to be a velocity depth filter of 0.04 m$^2$/s and an area filter of 200 m$^2$.

Finally, the Northern Beaches Council was formed by the amalgamation of three separate councils with different requirements with regard to filtering of flood mapping results. Through a process of harmonisation, which is the subject of a separate paper, standard filtering criteria were developed to apply to all studies in the LGA. A detailed investigation was undertaken to ensure that the criteria would provide the appropriate mapping outcomes for land use planning.