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Our Ref: DJW: L.T2139.005.docx

2 February 2023
Catholic Diocese Maitland Newcastle
c/o SHAC
224 Maitland Road
Islington NSW 2296
Attention: Jessica Maher

Dear Jessica

RE: FLOOD IMPACT ASSESSMENT FOR PROPOSED MULTI PURPOSE CENTRE AT 20-24 HUNTER STREET, HORSESHOE BEND NSW

Background

Torrent Consulting was engaged to undertake a Flood Impact Assessment to assist in the DA process for the proposed Multi-Purpose Centre for the All Saints College at 20-24 Hunter Street, Horseshoe Bend, NSW (the Site). The assessment was completed in March 2022 (refer L.T2136.003). After review of the assessment, Maitland City Council has requested an assessment of the proposed development for potential impacts on flooding from local catchment runoff. The original assessment only considered regional flooding from the Hunter River, which is the principal source of flood risk at the Site.

The Site is located on the right floodplain of the Hunter River, some 250 m south of the levee bank, as presented in Figure 1. There is no local catchment flooding information available and so a TUFLOW model of the local catchment has been developed for this assessment. The local catchment draining to the Site is only around 1 ha in size. However, if the capacity of local stormwater drainage network is exceeded, then a total of around 19 ha can drain to a topographic depression centred on Odd Street, in which the south-eastern part of the Site is located.

The local floodplain topography is presented in Figure 2. The topographic depression local to the Site is evident, as is a secondary depression to the east, at the western end of Cathcart Street. In a rainstorm scenario, with insufficient local drainage capacity, these depressions will begin to fill with ponded water. If the water level rises sufficiently then these two storages will eventually become connected via Carrington Street at a level above approximately 7.1 m AHD. The outlet for overland flow from the combined storage is at a level of around 7.2 m AHD, via Raglan Street.

Model Development

For this assessment, a TUFLOW model was developed covering the area draining to the limit of local catchment runoff ponding, at which the contributing catchment area is around 19 ha. The model utilised the NSW Spatial Services LiDAR data product, downloaded via the ELVIS Foundation Spatial Data portal to define the floodplain topography. The model was constructed using a 2 m horizontal grid cell resolution, with the sub-grid sampling routine enabled to define model elevations from a 1 m resolution LiDAR Digital Elevation Model (DEM).

To provide a conservative estimate of local catchment flood conditions, the entire catchment was modelled with a Manning's 'n' hydraulic roughness of 0.02 and zero initial or continuing rainfall losses. No sub-surface stormwater drainage network was modelled either, assuming a complete blockage and retention of all

catchment rainfall within the local floodplain storage, until the overflow along Raglan Street is reached, where a model boundary was provided to enable outflows to occur. Design rainfall was applied directly to the TUFLOW model DEM, generating catchment runoff.

The TUFLOW models were used to simulate the catchment rainfall-runoff process, utilising the ensemble storm method outlined in the ARR 2019 guidelines.

Flood Impact Assessment

For local catchment runoff there are three potential critical conditions for flood impacts associated with the proposed development:

- Local redistribution of overland flow running through the Site
- Loss of volumetric storage within the Odd Street topographic depression
- Loss of volumetric storage within the combined topographic depressions.

To identify the critical duration for each of these three conditions, the TUFLOW model of the catchment was simulated (using the HPC solver) for the 1% AEP event for a full range of storm durations. The design rainfall depths were sourced from the BoM IFD (Intensity Frequency Duration) portal. Because of the small catchment area, no areal reduction factor was applied.

The ensemble method involves the simulation of ten rainfall temporal patterns for each design event magnitude and duration, with the average condition of the ten being adopted for design purposes. The TUFLOW model simulations were analysed to identify the critical storm duration for each of the three scenarios. The 15-minute duration was identified as being critical for the local overland flow condition, with the 6-hour being critical for the Odd Street storage and the 12-hour duration filling the combined storage.

The three 1% AEP design event scenarios were simulated for the pre- and post-development conditions, with the results being compared through a relative flood impact assessment. Figure 3 to Figure 5 present the peak flood level impacts, with Figure 6 to Figure 8 showing the peak flood velocity impacts. The figures show a negligible change in the modelled peak flood levels or velocities for each of the three scenarios. A peak flood level increase of 7 mm has been modelled within the Odd Street storage for the 6-hour storm duration, with zero impact to the Cathcart Street storage. For the 12-hour storm duration a peak flood level increase of 4 mm has been modelled across the combined storages. This does not represent a tangible adverse impact, particularly given the conservative assumption of a full blockage of the stormwater drainage network.

Conclusion

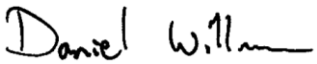
The Site at All Saints College at 20-24 Hunter Street, Horseshoe Bend, NSW requires a flood impact assessment considering local catchment runoff, having been requested by Maitland City Council. The assessment has included development of a TUFLOW hydraulic model to simulate local catchment 1% AEP design flood conditions at the Site.

The flood impact assessment has found that the proposed development has a negligible impact to the modelled peak flood levels and peak flood velocities. Impacts from the development to the peak flood level of the 1% AEP event within the local catchment are expected to be much less than 10 mm and do not represent a tangible adverse impact to the existing flood conditions.

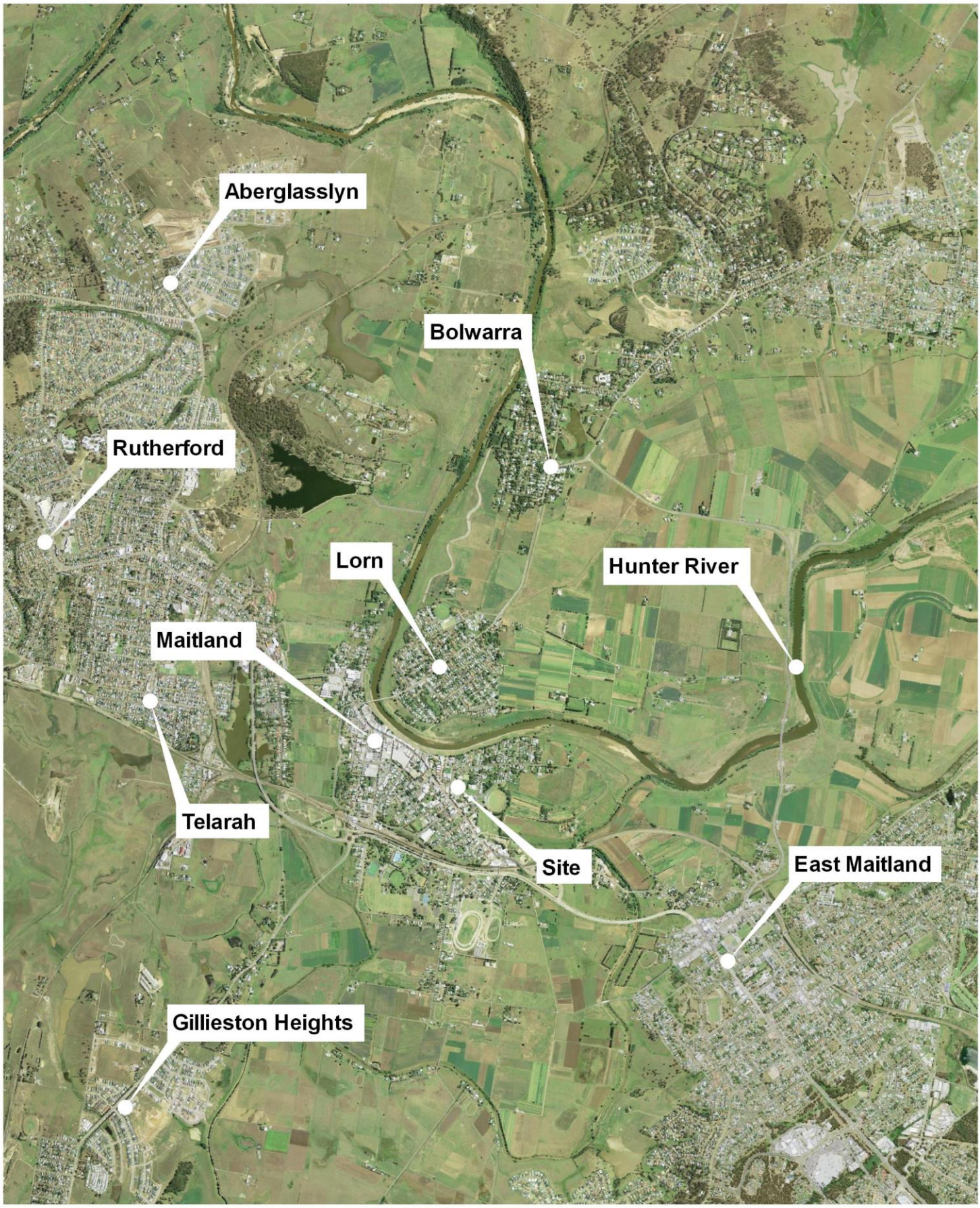
We trust that this report meets your requirements. For further information or clarification please contact the undersigned.

Yours faithfully

Torrent Consulting



Dan Williams
Director



Title:

Study Locality

0 1 2 km

approx. scale

Figure: 1

Revision: A

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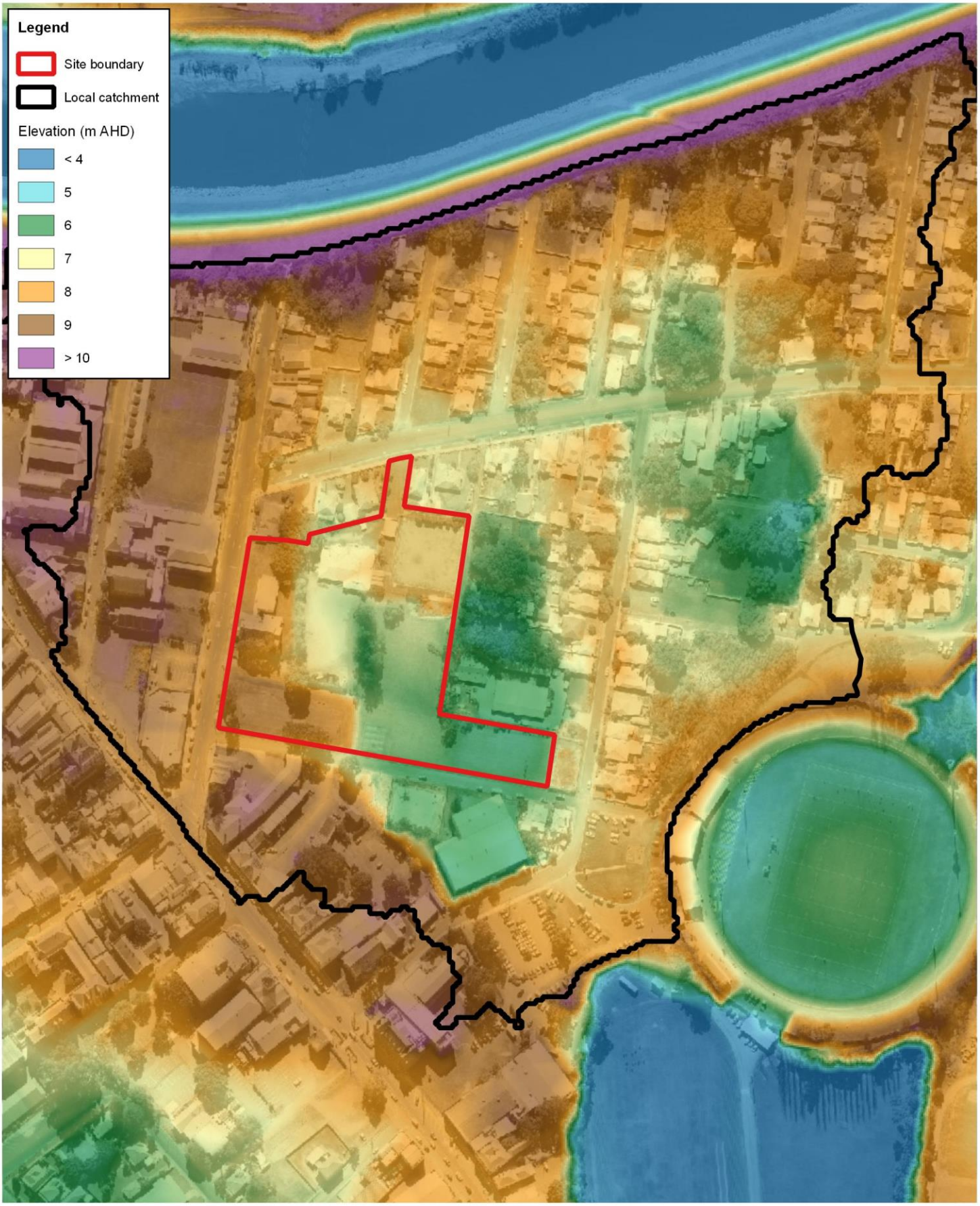

Title:

Local Floodplain Topography

0 80 160 m

approx. scale

Figure: 2

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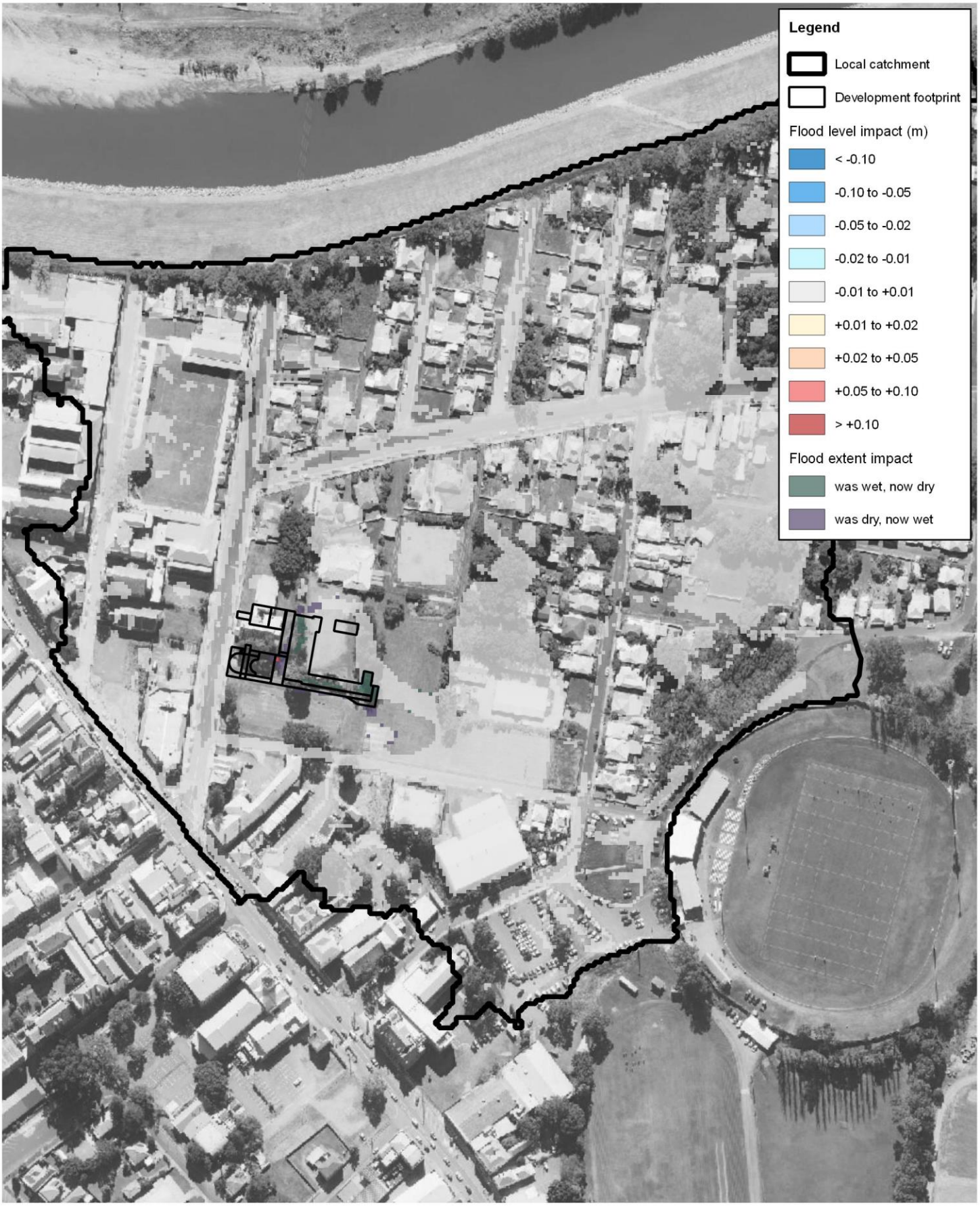

Title:

1% AEP 15-min Peak Flood Level Impact

0 80 160 m

approx. scale

Figure: 3

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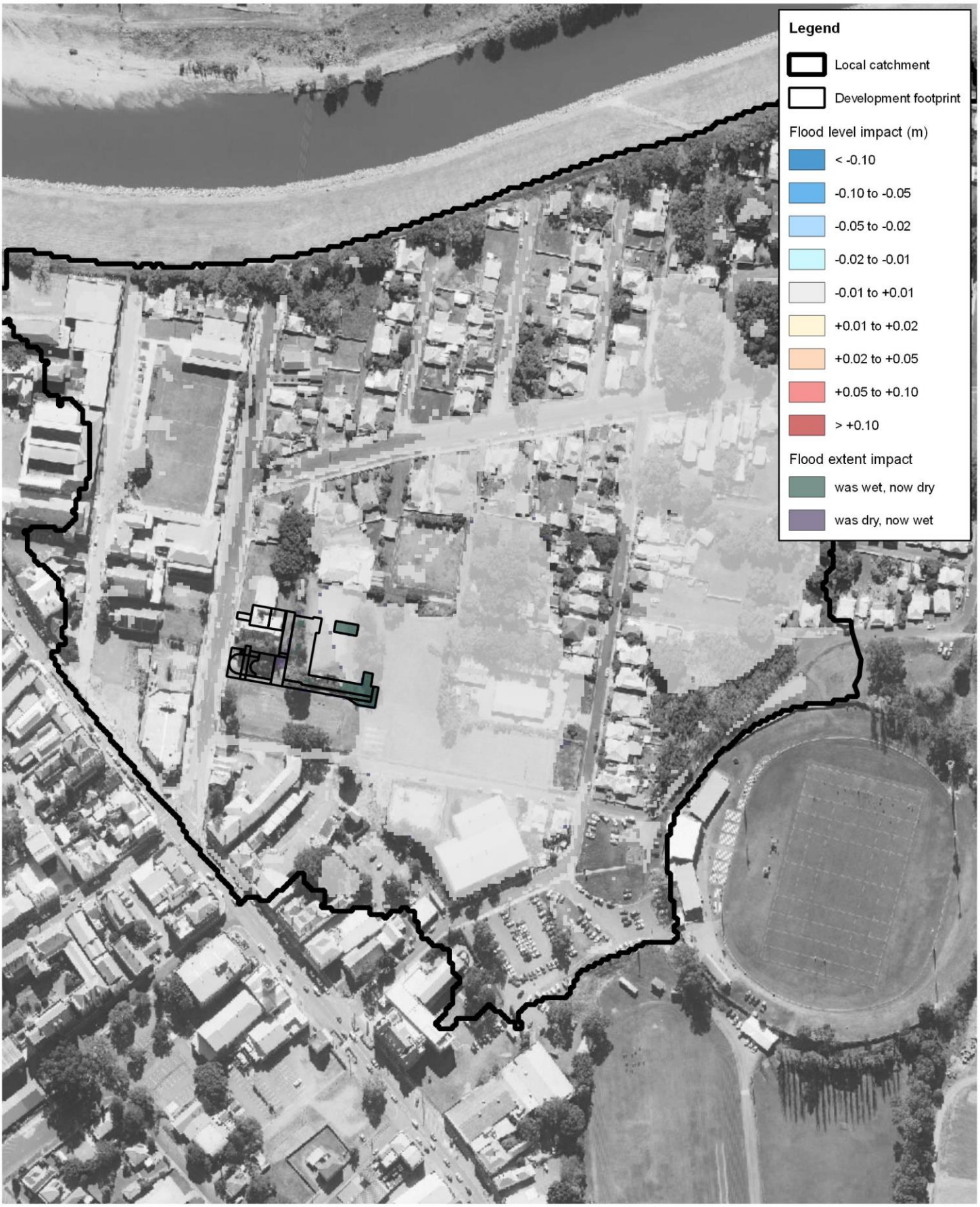

Title:

1% AEP 6-hour Peak Flood Level Impact

0 80 160 m

approx. scale

Figure: 4

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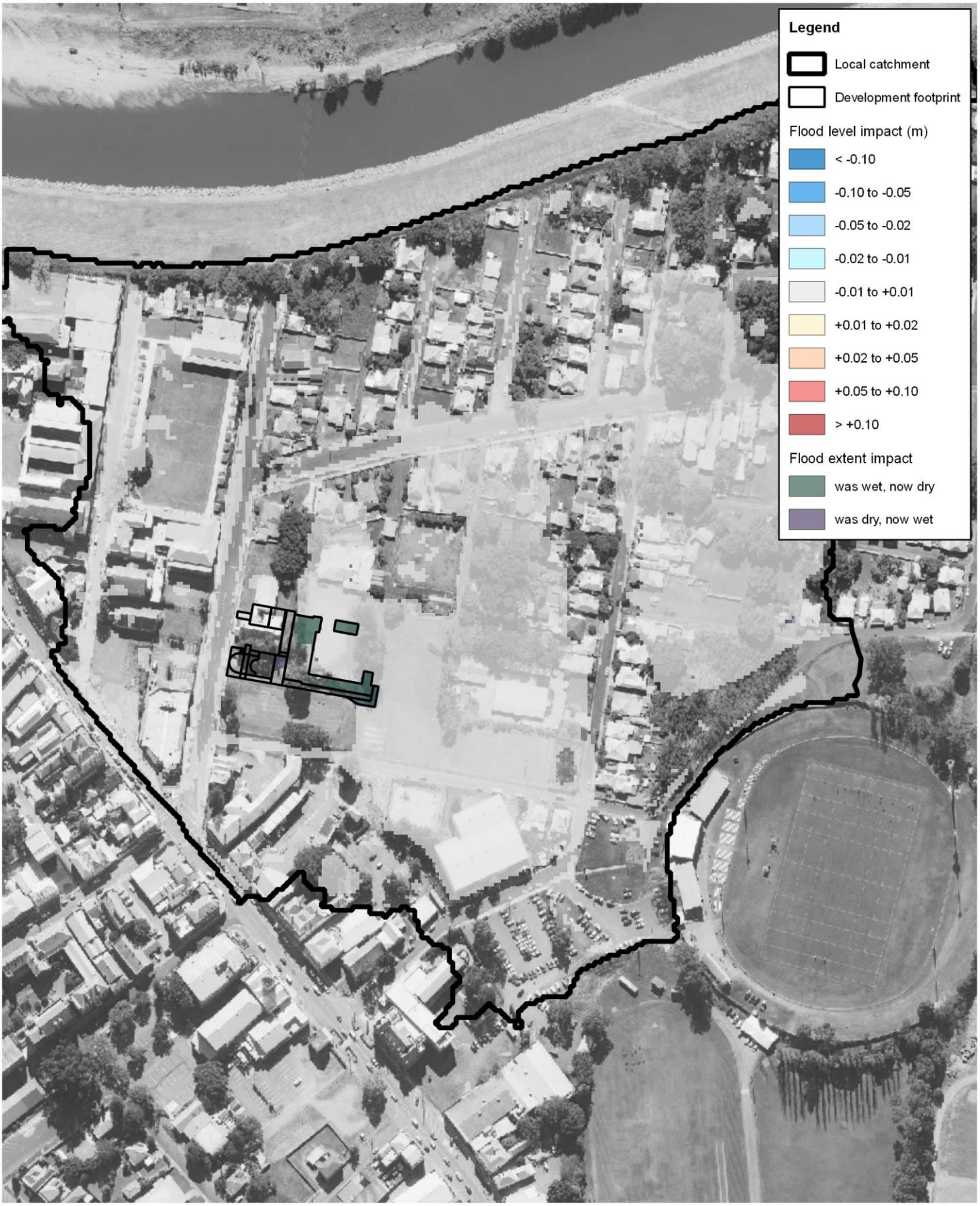

Title:

1% AEP 12-hour Peak Flood Level Impact

0 80 160 m

approx. scale

Figure: 5

Revision: A

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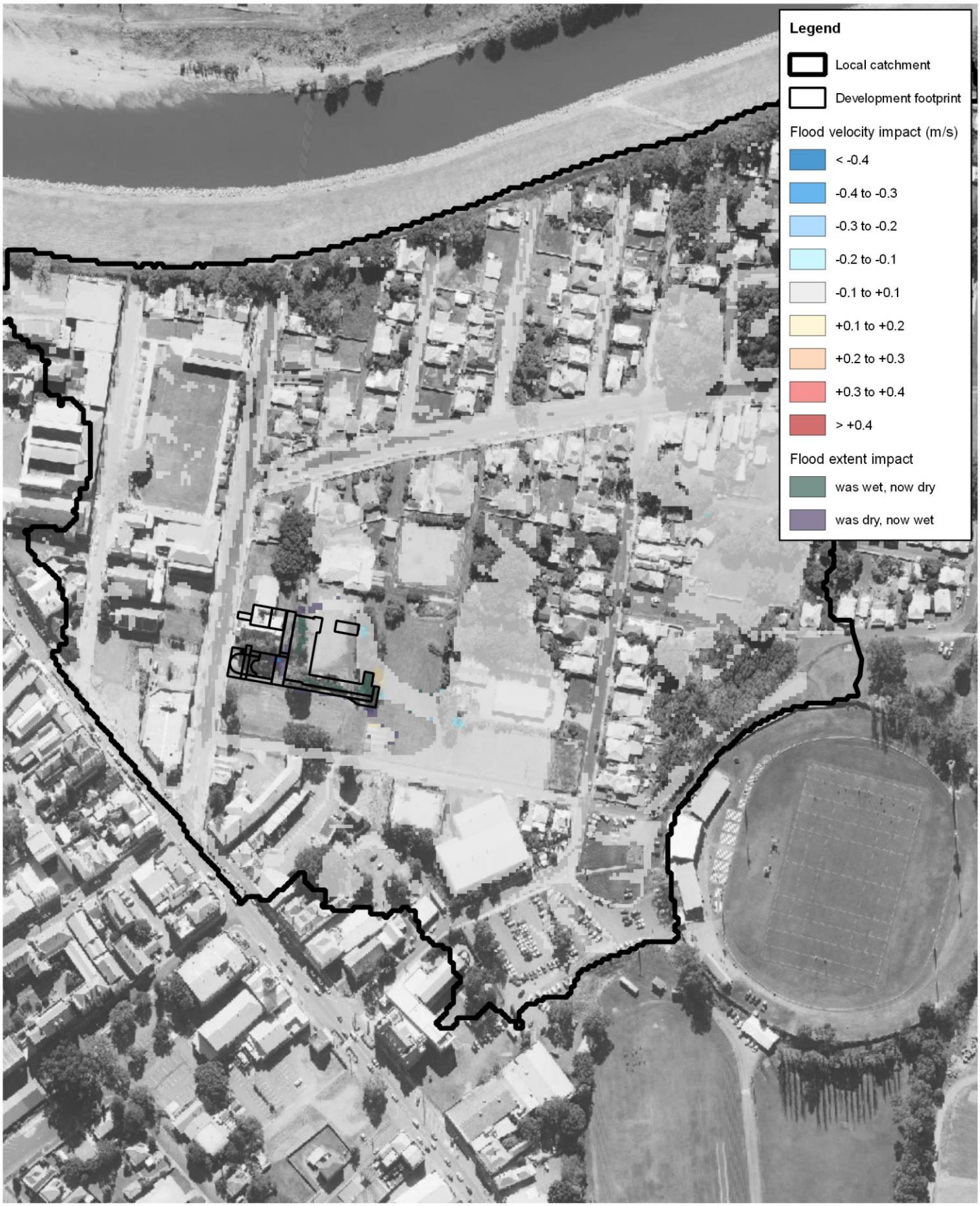

Title:

1% AEP 15-min Peak Flood Velocity Impact

0 80 160 m

approx. scale

Figure: 6

Revision: A

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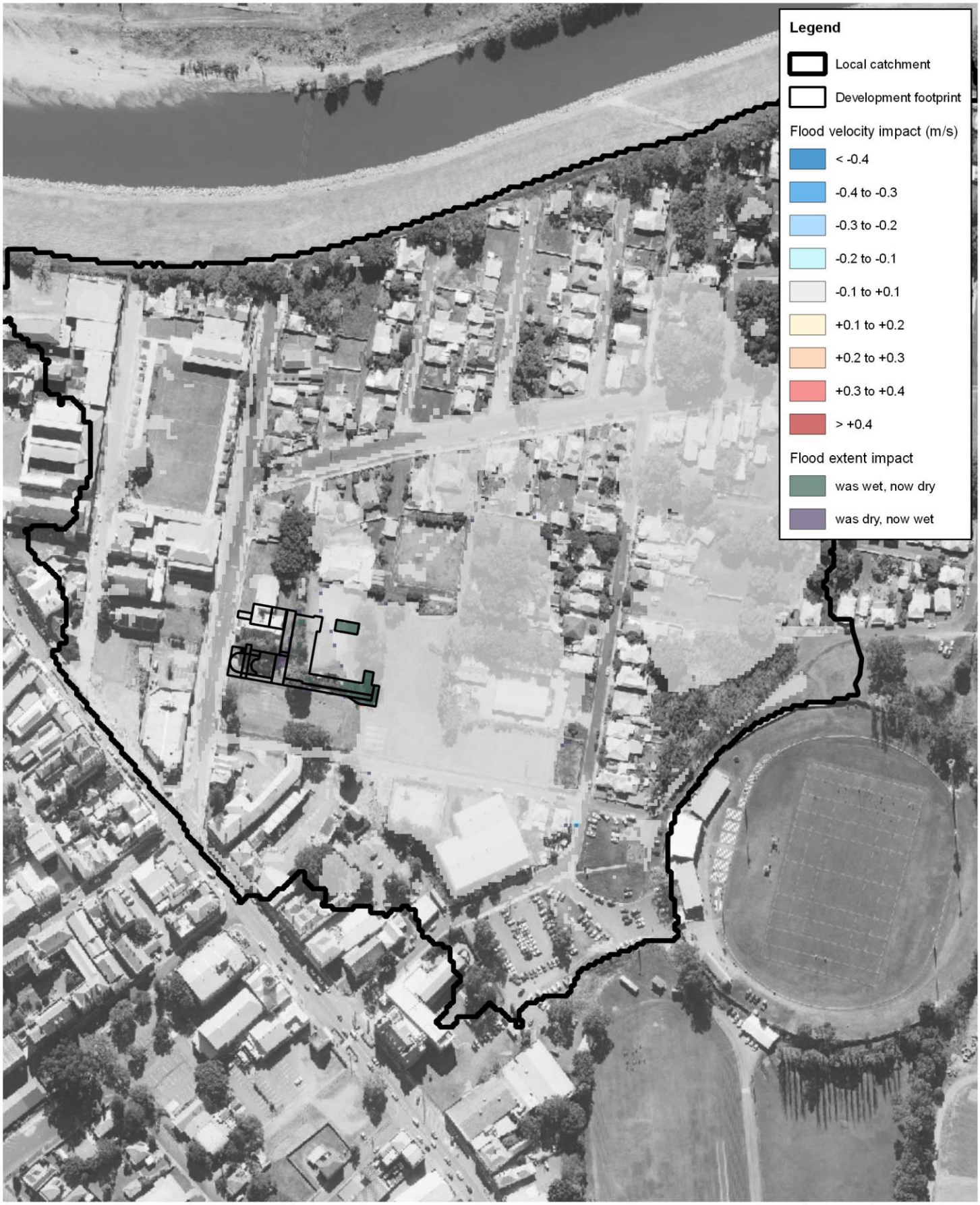

Title:

1% AEP 6-hour Peak Flood Velocity Impact

0 80 160 m

approx. scale

Figure: 7

Revision: A

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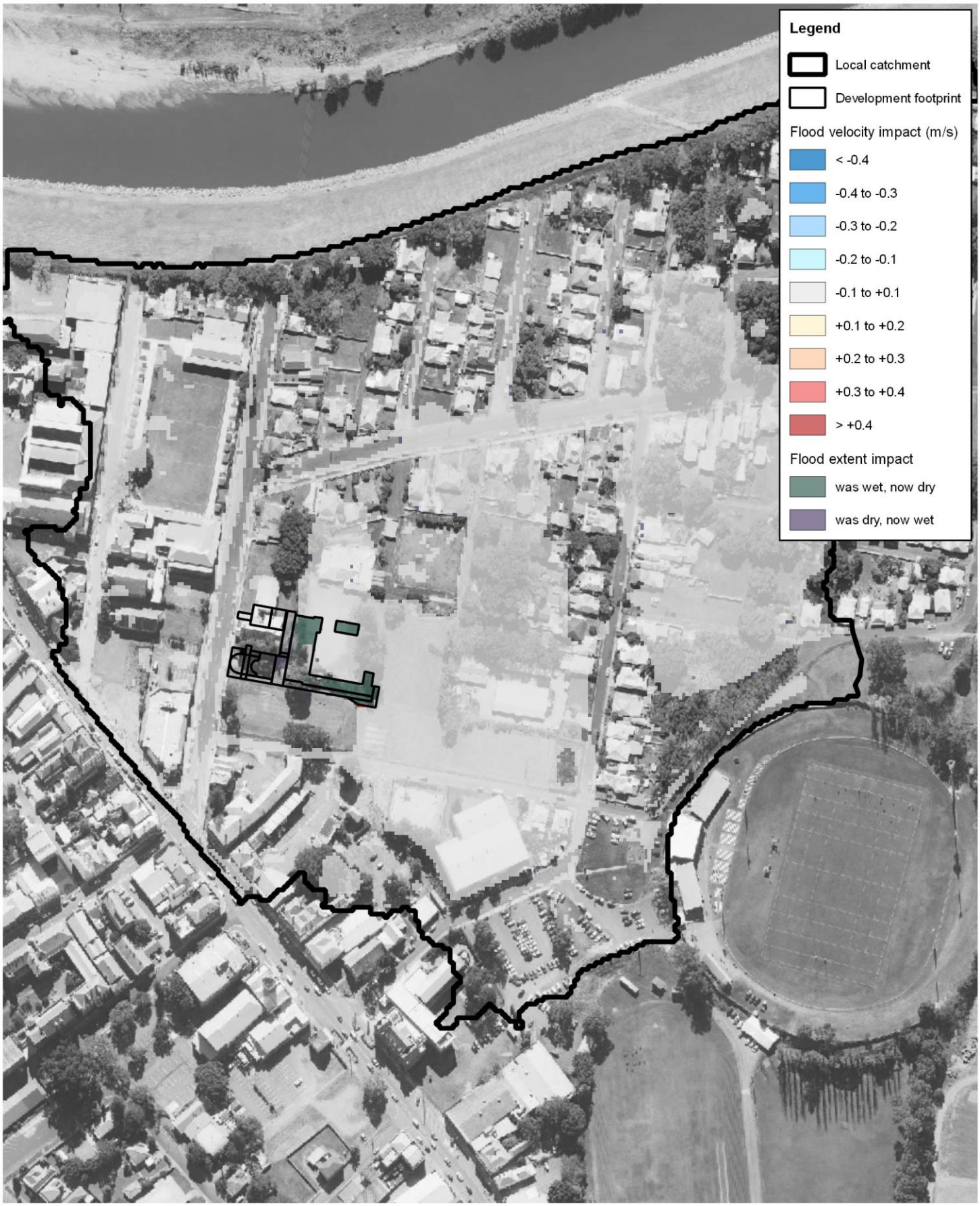

Title:

1% AEP 12-hour Peak Flood Velocity Impact

0 80 160 m

approx. scale

Figure: 8

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