

15. Surface water and flooding

15.1 Existing environment and background

This chapter draws on information from Appendix N (Hydrology and flood assessment). Groundwater impacts are assessed in Chapter 16 (Groundwater, soils and contamination).

15.1.1 Flooding and drainage

The project area is on the ridge of two main catchments: Darling Harbour and Blackwattle Bay. Both drain north-west towards Sydney Harbour via a series of connected stormwater drains and underground pipes. The system manages to deal with the runoff except during a heavy storm when water is known to back-up and flow overland.

On the rare occasions when this happens a thin layer of water forms, called a sheet flow, that flows from Foveaux Street to the east and Elizabeth Street to the south, before combining and heading westward along Eddy Avenue to Barlow Street and Rawson Place. Figure 15-1 below shows the route the flood water takes.

Flood modelling was carried out to assess Eddy Avenue Plaza in isolation as it was the only area of the project that involved changes with a potential to impact flood conveyance (that is, the movement of water associated with flooding). This was determined in preliminary studies for the wider Central Precinct Renewal Program (CPRP), such as the [CPRP Water Quality, Flooding and Stormwater Report](#) (Transport for NSW, 2022o).

Even in an extreme storm that only has a one per cent chance of occurring every year, the flood water depth is predicted to be less than 100 millimetres at its deepest within Eddy Avenue Plaza (see Figure 15-1), namely along the kerbs and gutters at Eddy Avenue. Similarly, along Eddy Avenue Colonnade flood depths are at its deepest along the kerbs and gutters where water can pool up against this hard surface.

When this happens, the water drains away at a rate of around 1.5 metres per second, or roughly walking pace. This means the area is only 'flooded' (called the inundation) for a short period of time (see Section 4.2 of Appendix N (Hydrology and flood assessment)).

The [Australian Rainfall and Runoff Guide to Flood Estimation](#) (2019) uses the above information to classify flood hazards into six categories (H1 to H6). The flood hazard around Eddy Avenue and the Plaza is low, where it is generally safe for people, vehicles, and buildings (H1), with a small area in front of the Sydney Terminal Building, where it is potentially unsafe for small vehicles (H2). This is shown on Figure 15-2 below.

15.1.2 Water quality

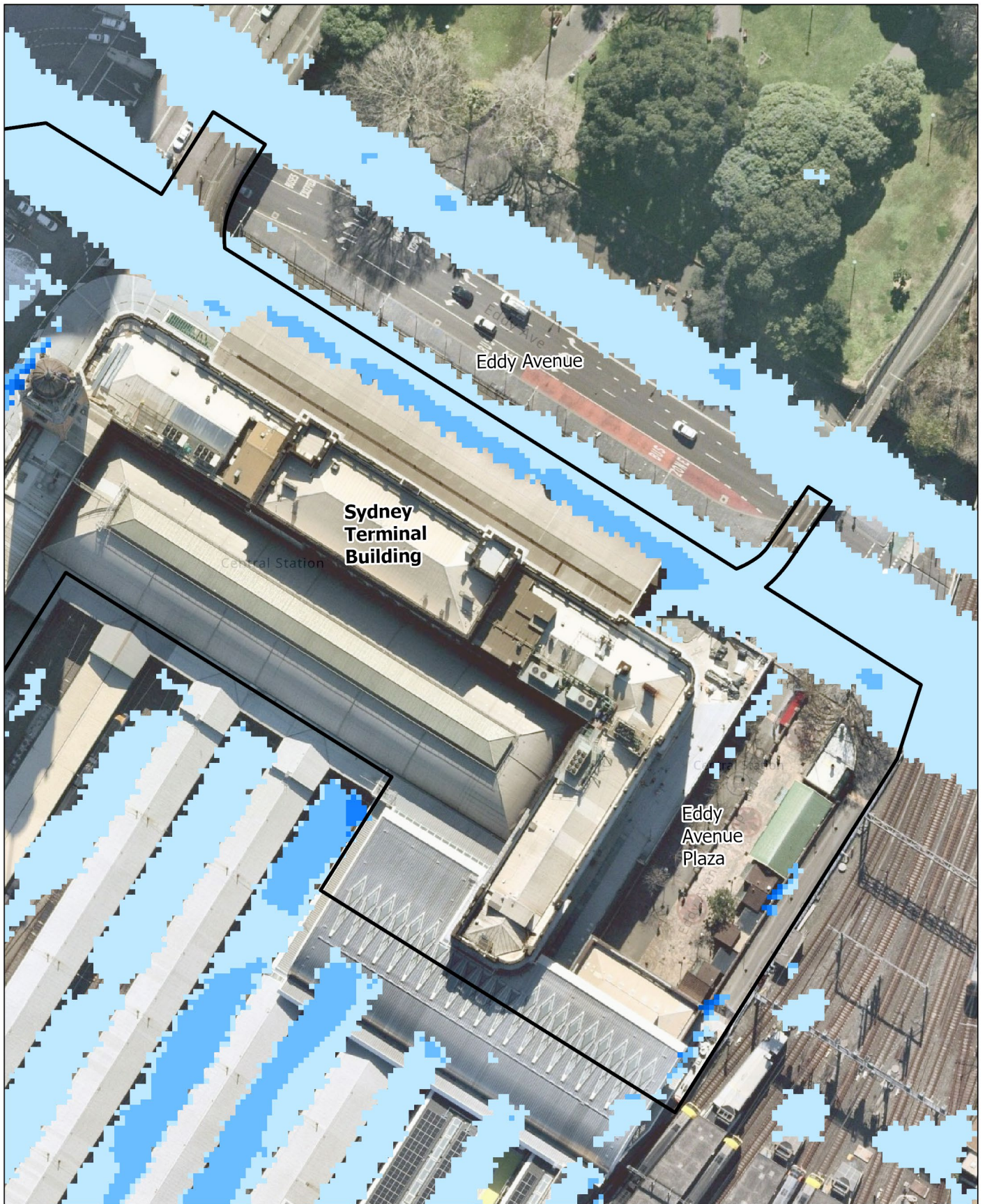
The quality of stormwater runoff in the project area is influenced by surface pollutants typical of urban catchments, including oils and hydrocarbons, heavy metals, chemicals (from spills, localised pesticide/herbicides application or inappropriate waste disposal), sediments and gross pollutants such as litter and other debris. The presence of pollutants from the rail corridor further impacts the quality of stormwater runoff from the area.

From Central Station, stormwater runoff drains north to Sydney Harbour through either the Darling Harbour catchment in the north or Blackwattle Bay catchment in the south. The water quality of these two catchments is influenced by the widespread urbanisation of the upstream catchments and is considered to be poor against locally derived environmental and ecological guideline values and Australian and New Zealand Environment and Conservation Council (ANZECC) water quality guideline levels, with increased levels of nutrient, bacterial and sediment concentrations (Local Land Services, 2015).

15.1.3 Policy and planning setting

The assessment considered the following relevant policies and guidelines:

- [Australian Rainfall and Runoff: A Guide to Flood Estimation](#) (Institution of Engineers, 1987)
- [Australian and New Zealand Guidelines for Fresh and Marine Water Quality](#) (ANZECC, 2000)
- [Flood Prone Land Policy](#) (NSW Department of Planning and Environment, 2005)
- [Floodplain Development Manual](#) (NSW Department of Infrastructure, Planning and Natural Resources, 2005)
- [Sydney Local Environmental Plan 2012](#) (NSW Government, 2012)
- [Interim Floodplain Management Policy](#) (City of Sydney, 2014)
- [Australian Rainfall and Runoff: A Guide to Flood Estimation](#) (Commonwealth of Australia, 2019)
- [CPRP Water Quality, Flooding and Stormwater Report](#) (Transport for NSW, 2022o)
- [NSW Floodplain Risk Management Guidelines](#) (NSW Department of Planning and Environment, 2022c).



Coordinate System: GDA2020 MGA Zone 56



Metres
0 10 20
Scale at A4
1:1,000

Data Source
Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Esri Community Maps Contributors, Spatial Services, Geoscape, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS

Prepared by: MD
Checked by: AS
Approved by: AS

Legend

Construction footprint

Existing flood depth (m)

- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 0.75
- 0.75 to 1.00
- 1.00 to 1.25

Sydney Terminal Building Revitalisation Project

Figure 15-1: Peak flood levels around Eddy Avenue and the Plaza

Project Number: 287415

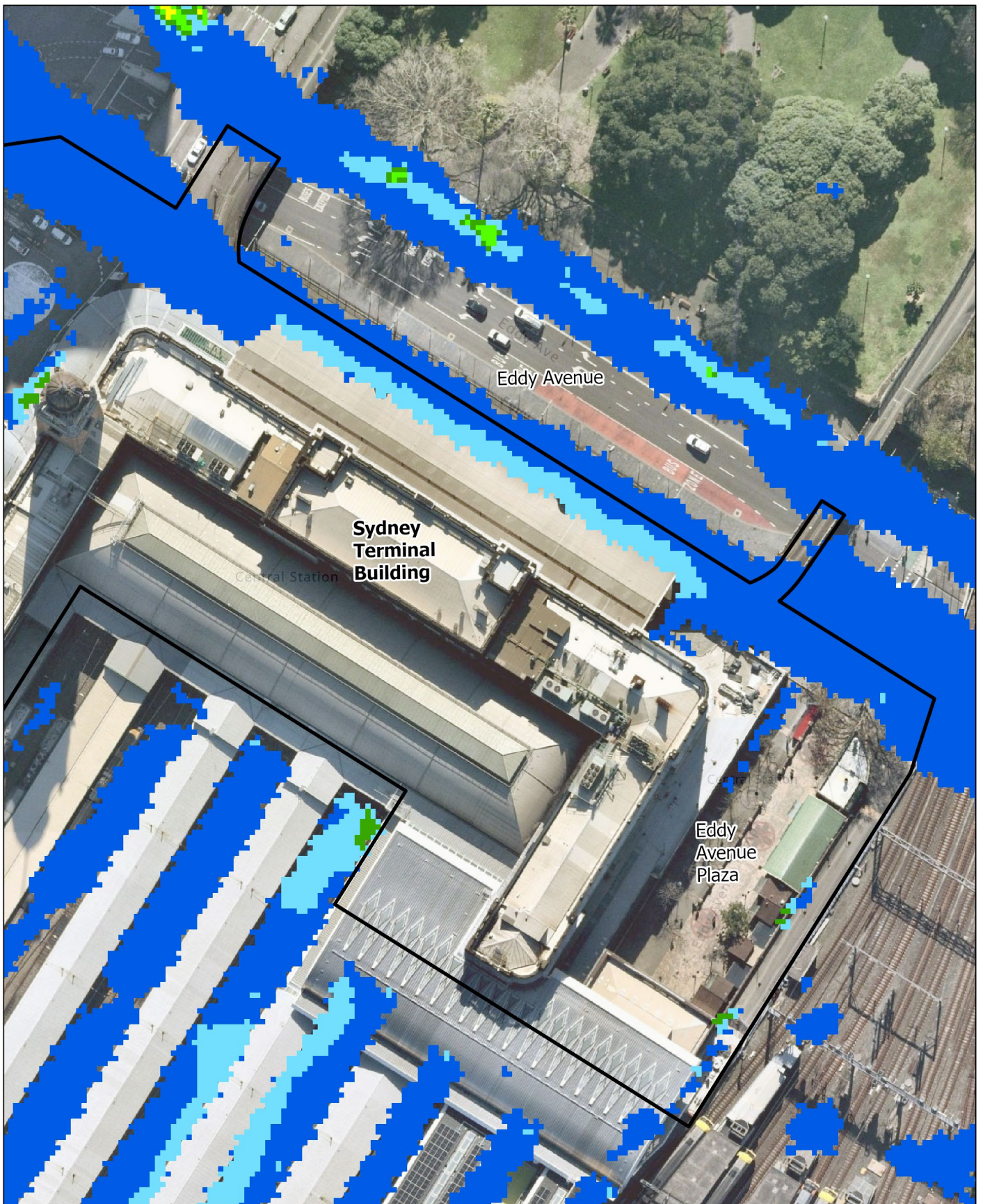
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Coordinate System: GDA2020 MGA Zone 56



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Prepared by: MD
Checked by: AS
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Legend

Construction footprint

Existing flood hazard

- H1 - no restrictions
- H2 - unsafe for small vehicles
- H3 - unsafe for vehicles & children
- H4 - unsafe for people & vehicles
- H5 - unsafe for people & all vehicles
- H6 - unconditionally dangerous

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Figure 15-2: Flood hazards around Eddy Avenue and the Plaza

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15.2 Assessment of potential impacts

15.2.1 Construction

Flooding and drainage

The proposed work in Eddy Avenue Plaza will largely take place in areas that are not at risk of flooding (see Figure 15-1). This means there is no material risk of impact during construction except for the two months when excavation is needed to demolish the existing service ramp (see Section 5.3.4 of the EIS), as this may temporarily change the ground levels which could affect how flood waters flow overland.

Potential impacts associated this work would be:

- An increased surcharge (water backing up) in the stormwater system due to:
 - Temporarily changing runoff rates and flow paths, and therefore discharging more water to certain drainage lines
 - Reducing the capacity of the existing drainage infrastructure through sediment discharge during excavation
- Local ponding, pooling, and flooding during and following heavy rainfall.

While the impacts would be small scale, the above may lead to the following impacts:

- Collection of water in open excavations and associated worker safety risks
- Additional erosion and loss of soil from temporarily exposed areas
- Stockpile and earthwork destabilisation from additional washout
- Potential discharge of pollutants from accidental spills
- Loss of landscape planting due to washout.

Each of these has the potential to impact downstream water quality, as described below.

There is also the potential for basement flooding due to, for example, the regrading of Eddy Avenue Plaza.

Once the works are finished in Eddy Avenue Plaza, all levels would be reinstated. This means there would be no net change in flood behaviour or drainage conditions on site (see Section 15.2.2 below).

The only other area of the proposed works that is outdoors is the southern construction area (see Figure 5-9 of the EIS). This area is not at risk of flooding (see Figure 15-1 above) and it would only be used to store equipment and machinery. This means there would be no temporary change in ground levels and therefore no flood impacts. However, similarly to above, there is the potential for stockpile destabilisation from additional washout and pollutant discharge from accidental spills, which could impact on downstream water quality, as described below.

Water quality

Potential impacts to the quality of stormwater runoff during construction could occur as a result of:

- Earthworks or movement of soil resulting in sediment laden runoff and sedimentation, as well as the release of any in situ contaminated material within the soils
- Contamination from accidental spillages of fuels, lubricants, effluent and other chemicals and materials used during construction
- Dewatering open excavations following periods of rainfall, which may contain sediments and other pollutants mobilised by the rainfall.

Where sediments from construction areas enter receiving waterways, there is the potential to adversely impact water quality (for example, by increasing turbidity, lowering dissolved oxygen levels, increasing nutrients and introducing pollutants).

Potential impacts to the quality of receiving environmental are considered to be negligible due to the already highly urbanised catchments, as described in Section 15.1.2 above.

15.2.2 Operation

Appendix N (Hydrology and flood assessment) used modelling to compare the flooding conditions after the project is built with the existing conditions. The resulting changes in flood levels (a term called afflux) were mapped for various storm events. Only under the most extreme event would there be a change in flood level and runoff rate, and this would be at the interface between Eddy Avenue and Eddy Avenue Plaza. The changes would be so small that they would have no impact on the flood hazard rating. They would also not affect the duration for which the area would be flooded.

There are no model-predicted changes anywhere else in the project area. This is because there will only be minor changes to ground levels and gradients, and no changes to catchment size, points of discharge and extent of paving (hardstand). Also for these reasons, the impact of the project on water quality would be largely consistent with its operation pre-construction.

15.3 Environmental management measures

Both positive and negative surface water and flooding impacts will be addressed in the form of management measures. Measures to minimise impacts relating to groundwater, soils, contamination, biodiversity, and hazards and risks are addressed in other impacts chapters and have not been included here. Table 15-1 lists the measures to manage surface water and flooding impacts specifically.

Table 15-1: Environmental management measures – surface water and flooding

Ref	Impact / Uncertainty	Environmental management measure	Timing
SWF01	Impact Flooding	The following will be reviewed during the detailed design to validate the flooding impact: <ul style="list-style-type: none"> Ground levels, gradients, catchment size, points of discharge and extent of paving (hardstand) remain unchanged Adopted method, proposed activities, and temporary designs are consistent with the model inputs. 	Detailed design
SWF02	Uncertainty Design development	Flood modelling will be updated if there is a material change in the design that will affect the flooding risk. Where needed additional flood mitigation will be included to maintain the flood levels, runoff rates and inundation times.	Detailed design
SWF03	Impact Erosion and sediment run off	A Soils and Water Management Plan (SWMP) will be developed and implemented as part of the Construction Environmental Management Plan. The sub-plan will include detailed soil and erosion sediment control plans consistent with the requirements of <u>The Blue Book: Managing Urban Stormwater: Soils and Construction</u> , Volume 1 and Volume 2 (Landcom, 2004). The SWMP will: <ul style="list-style-type: none"> Include the required processes/procedures for excavation, handling, storage, and transport of sediment and arrangements for managing pollution risks associated with spillage or contamination Ensure that all new or modified drainage associated with the project will be designed to meet the capacity constraints of the City of Sydney Council's stormwater drainage system to receive and convey the proposed flows from the project, or otherwise upgrade Council's drainage system at the proponent's expense, in consultation with the City of Sydney Council Not worsen localised flooding, including around Eddy Avenue Plaza and along Eddy Avenue Involve consultation with NSW Environment Protection Authority, NSW Department of Planning and Environment, Sydney Water, and City of Sydney Council Include any requirements contained within the <u>Central State Significant Precinct study</u> and supporting technical documents where applicable. 	Pre-construction
SWF04	Impact Water quality	Equipment, plant and machinery refuelling, and maintenance will be carried out in impervious bunded areas within the identified construction area or at appropriate facilities that adhere to industry standards and pollution prevention regulations. Refuelling will always be attended. Machinery will be checked daily to ensure that there are no oil, fuel, or other liquid leaks.	Construction
SWF05	Impact Water quality	Vehicle wash-downs will be carried out offsite or within a designated bunded area with an impervious surface in the construction footprint.	Construction