
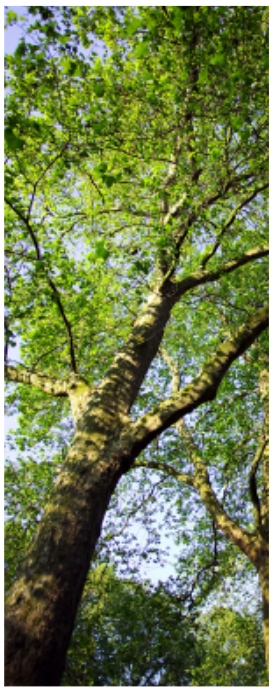


Masters Home Improvement Store - Nepean Green

Stormwater Management Report

July 2012

Parkview Penrith Pty. Ltd.

Mott MacDonald

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Nepean Green Stage 1, Project Application
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Content

1. Introduction

Mott MacDonald has been commissioned by Parkview Apartments to prepare a Stormwater Management Report for the proposed commercial development works at 164 Station Street, Penrith. This report will be lodged with Penrith City Council (PCC) in support of the Project Application (PA), and should be read in conjunction with the separate Civil Engineering, Stormwater and Infrastructure Report by Mott MacDonald prepared for the proposed Nepean Green development.

The advice as outlined in this report and documented on Mott MacDonald drawings MMD-310574-C-DR-00-XX-0010 to 0020 addresses the following engineering components:

- Water Quality Measures (refer to section 4.1 of this report); and
- Water Quantity (refer to section 4.2 of this report).

2. Site Description and Proposed Works

The subject site is Lot 12 DP234581 located at 164 Station Street, Penrith, approximately 1.2km south west of the Penrith CBD. The proposed works are to be carried out on the vacant parcel of land on the southern portion of the site and consist of a 13,603m^2 commercial home improvement store and 380 on grade car spaces. The proposed development is to form part of the new Nepean Green precinct.

The proposed lot and open spaces layout have been taken from the current proposed Project Application documentation.

Figure 2.1 – Existing Site

The proposed development covers an area of approximately 3.49Ha and is bound by:

- Station Street / Penrith Stadium to the west;
- Jamison Road to the south;
- Woodriff Street to the east; and
- existing light industrial buildings to the north.

The connection point to the Council piped system is at Jamison Road along the southern boundary and will be the proposed discharge point for stormwater flows developed within the site.

3. Erosion and Sediment Control

Prior to any earthworks commencing on the site, erosion and sediment control measures will be put in place generally in accordance with Managing Urban Stormwater: Soils and Construction 4th Edition, March 2004. These measures include:

- Installation of a 1.8m high chain wire fence covered with geo-textile filter fabric, to the perimeter of the work site area, where required;
- The use of sediment diverting methods to minimise sediment in Council's stormwater drainage using sandbagging kerb inlet pits and geo-fabric filter fabric around drop inlet pits;
- The provision of a sediment basin will be required where disturbed areas are greater than 2,500m^2. The sediment basin will be required to be designed in accordance with Urban Stormwater Quality Management Plan (1999) for which stormwater runoff shall be channelled and treated during construction; and
- The provisions of a temporary truck wash down facility to service vehicles exiting the site during the construction stage.

Please refer to Sediment and Erosion Control Plans MMD-310574-C-DR-00-XX-0010 and MMD-310574-C-DR-00-XX-0011.

4. Stormwater Management

4.1 Water Quality

Penrith City Councils *Development Control Plan (DCP)* 2010 requires improved water quality of the stormwater flow from the developed site prior to discharge into the authorities' drainage network.

Council also requires the removal of target pollutants from the site during the construction phase as vehicles that may enter or exit could generate various pollutants such as oil and grease. These target pollutants can be identified into five major groups of stormwater pollutants:

- Gross pollutants;
- Coarse, medium and fine sediments;
- Nutrients;
- Heavy metals; and
- Oil and grease.

4.1.1 Water Quality Objective

In accordance with Table C3.2: Pollution Retention Criteria of Penrith City Council's Development Control Plan, we note that the following targets have been set in relation to stormwater quantity:

- Reduction in annual average suspended solids (SS) export load of 50%;
- Reduction in annual average total phosphorus (TP) export load of 45%
- Reduction in annual average total nitrogen (TN) export load of 45%; and
- Reduction in annual average gross pollutant (GP) export load of 70%

In addition to satisfying the requirements and standards of Council, the promotion of sustainable water practices must comply with the protection or enhancement of natural water quality as stated in Penrith City Council's Local Environment Plan.

4.1.2 Proposed Treatments

Proposed Treatment devices are listed and discussed below:

4.1.2.1 Gross Pollutant Trap (GPT)

"Gross Pollutant Trap" is a term applied to either in-situ, or proprietary units that remove litter, vegetative matter and sediment. Although the numerous units fall under the one umbrella of gross pollutant traps, the actual mechanics of the different units vary, as do the achievable pollutant removal rates. GPTs come in a range of sizes, with the larger units able to effectively treat large catchment areas and high flow rates. They are usually sized based on their maximum treatable flow being equal to, or greater than the 3-month Annual Recurrence Interval (ARI) storm event (typically 50% of the 1-year ARI storm event) of the upstream catchment.

In developing the MUSIC model for the site, a Humegard / Humeceptor arrangement positioned in series is proposed at the outflow from the development area. The proposed GPTs have been positioned to maximise flow and enable easy access for maintenance. The Humegard is to provide primary treatment and target larger gross pollutants and sediments. Treated water will then pass through the proposed Humeceptor (secondary treatment) further downstream, which targets oils and grease, nutrients and fine sediments.

4.1.2.2 Rainwater Tanks

Rainwater tanks are sealed tanks designed to retain rainwater collected from roofs for subsequent re-use on site. Roof water from the proposed building has been modelled to discharge directly to a rainwater harvesting tank situated beneath the pavement in the carpark area. This tank is to store water for re-use associated with irrigation of the proposed garden centre. Water demand rates for the garden centre have been defined based on assumed irrigation areas in order to attain the most efficient water usage on site. A preliminary analysis based on estimated water demand indicates that rainwater tanks totalling around 100kL will be satisfactory.

MUSIC Rainwater Tank Inputs

Irrigation Area (m^2)	Irrigation Requirement ($mm/m^2/week$)	Weekly Demand (kL)	Daily Demand (kL)
1565*	25	39.13	5.59

* Based on assumed irrigation area of 70% of total Garden Centre area

The excess water from the harvesting tanks will discharge into the stormwater network and through the GPTs prior to exiting the site. Due to the uncertain nature of the rainwater supply, the tanks will be connected to mains water for “top-ups” in dry weather conditions.

4.1.3 Water Quality Outcomes

This report is designed to be read in conjunction with the separate *Civil Engineering, Stormwater and Infrastructure Report* prepared by Mott MacDonald which provides the overall approach to stormwater management for the Nepean Green site. As such, each of the individual stage development applications are to be designed to coincide with the overall master plan strategy with respect to water quality.

The proposed treatment measures as listed above have been provided in accordance with the Masterplan model which satisfies Council’s statutory requirements for pollutant removal rates. As such, the proposed treatment train for the Project Application consisting of GPTs (Humegard and Humeceptor) and Rainwater Re-Use will ensure that the water quality objectives set by Penrith City Council are met for the site.

4.2 Stormwater Quantity

The stormwater drainage for the proposed development has been designed to comply with the following guidelines:

- Penrith City Councils *Development Control Plan DCP* (2010);
- Penrith City Councils *Guidelines for Engineering Works for Subdivisions and Developments* (1997);
- Australian Rainfall and Runoff (2001); and
- Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, March 2004.

4.2.1 Stormwater Drainage

The major/minor approach to stormwater drainage is the recognised drainage concept for urban catchments within the Penrith City Council local government area.

The minor drainage system is comprised of the below ground pit and pipe network and is designed to control nuisance flooding and enable effective stormwater management for the site. Council's Stormwater Management Guidelines requires that the minor system be designed for a minimum 5 year ARI for all new developments (refer C3.6: Stormwater Management and Drainage from Councils DCP 2010 for details).

The major drainage system incorporates overland flow routes through proposed road, car parking and landscaped areas and is assessed against the 100 year ARI design storm event. The major system also exists to cater for minor system failures. In accordance with council's requirements, the major drainage system is to be designed in a manner that ensures that personal safety is not compromised. Subsequently, all overland flow routes for the site are to be designed so that the maximum velocity-depth product shall not exceed $0.4m^2/s$ as outlined in the NSW Floodplain Development Manual (2005).

For the purposes of this report, DRAINS software is used to calculate flows exiting the site for the proposed scenario. Stormwater piped capacities have been designed to convey the minor (5yr ARI) storm event with safe overland flows for the 100year ARI storm event.

4.2.2 Existing System

Detailed site survey by Dunlop Thorpe & Co. identifies an open channel (approximately 6.3m wide x 2.1m high) and culvert system which traverses the site along the southern boundary of Jamison Road.

Preliminary discussions with Penrith Council and visual site inspections indicate that piped stormwater flows from Jamison Road are conveyed to the channel via an existing 1050mm dia pipe, while an additional 750mm dia pipe allows flows to enter from the northern approach of Station Street.

There is an existing grass-lined drainage swale centrally located within the development site which drains north-south and conveys surface flows from the proposed Masters site to an outlet at Jamison Road. From here, flows are directed to the pit and pipe network within Jamison Road before discharging into the open channel to the south via the existing 1050mm dia pipe.

4.2.3 On-Site Detention

Informal discussions with Penrith City Council have indicated that on-site detention is not required for this proposal (refer to separate *Civil Engineering, Stormwater and Infrastructure Report* prepared by Mott MacDonald for details).

4.2.4 Proposed System

A DRAINS model was created to represent the proposed development to determine the size of the piped stormwater drainage system. The DRAINS model was developed based upon the following methodology:

- The pit and pipe network is proposed to connect to the existing stormwater network in Jamison Road at the southern boundary of the site. From here, flows are to be conveyed downstream to the open channel and culvert system via the existing 1050mm dia pipe;
- The remaining undeveloped areas (future stages 2-6) have been considered in the stormwater modelling as high-density residential with an effective impervious area of 80%. 2.57Ha has been modelled to drain to the authorities drainage network in Jamison Road via a new 450 x 1200 concrete box culvert. This will require the dedication of a stormwater easement along the south-east boundary of the development area. The remaining areas (1.79Ha) are to discharge to the existing pit and pipe network in Station Street (for more details refer to separate *Civil Engineering, Stormwater and Infrastructure Report* for Nepean Green);
- Tailwater conditions have been set at the obvert level of the pipe at the connection point to the existing open channel and culvert system; this level has been specified to simulate a charged system downstream. It has also been specified to verify the capacity of the internal piped network for flows generated from the 1 in 5 yr ARI storm event;

- An indicative pit and pipe network was developed for the proposed siteworks (refer civil engineering drawing MMD-310574-C-DR-00-XX-0020-23);
- The roof water from the proposed building is to be directed to a rainwater tank located beneath the car parking pavement, with overflows into the piped network. Designs for roof drainage shall be undertaken either as siphonic or conventional roof drainage by a certified Hydraulic Engineer;
- For the purposes of modelling, the rainwater tank is considered full during simulation;
- All paved areas are collected within grated pits and drains; and
- 5yr and 100yr ARI events were considered for all standard durations.

4.2.5 Results

Iterations were performed in the DRAINS model to determine the size of the piped network for the proposed site to satisfy major / minor system requirements in accordance with Penrith City Council standards.

The proposed piped drainage system has been designed to cater for the 1 in 5 year ARI event leading to the outlet to the Council drainage system at Jamison Road. A provision for overland flows for events greater than the 1 in 5 year ARI event has been considered.

Results indicate that the major / minor system requirements are satisfied at all pits within the development area and that the piped system sufficiently conveys minor storm flows with safe provision for major system flows.

4.2.6 Sensitivity Analysis

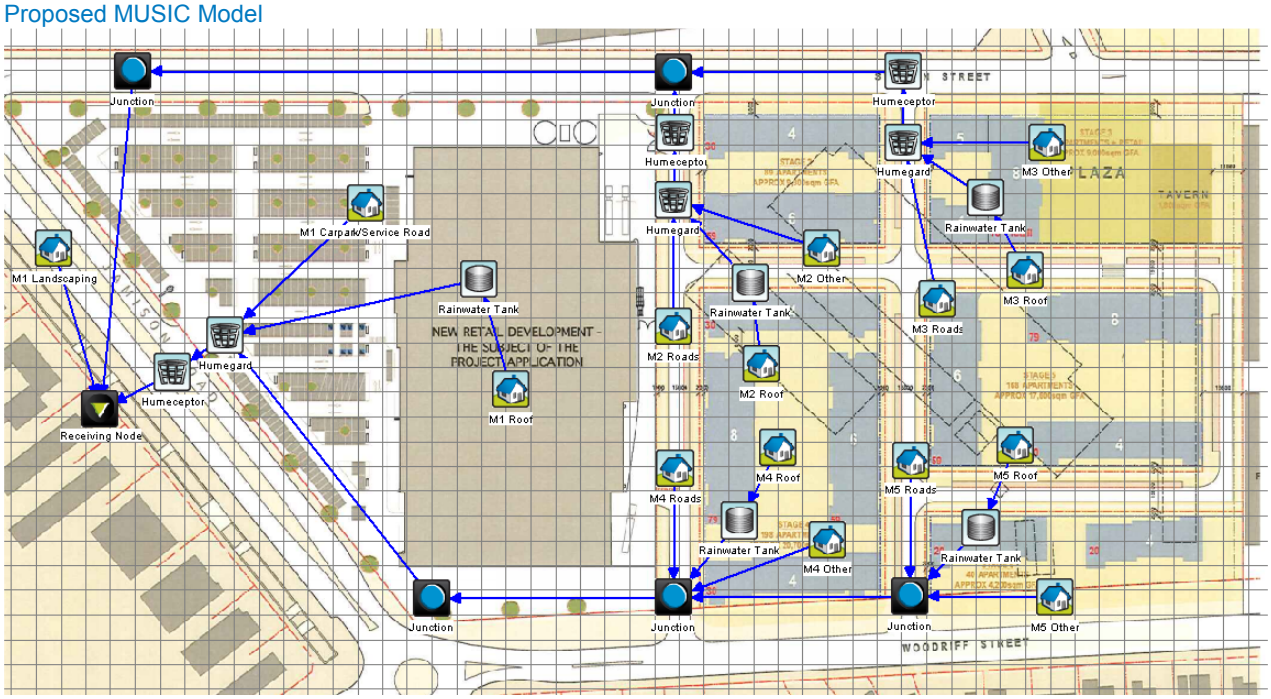
A sensitivity analysis was performed to assess the performance of the proposed stormwater network in the unlikely event that the peak discharge from the site coincides with the peak flow within the downstream open channel and culvert system (i.e. channel flow is full). The following methodology was utilised:

- tailwater conditions for the 5yr ARI event were conservatively set at 50% of the capacity of the open channel and culvert system; and
- the water level at the outlet for the 1 in 100yr ARI storm event was modelled 300mm below the top of channel level; this level was specified to simulate peak flows within the channel.

Results indicate that the minor system has sufficient capacity to convey 5yr ARI flows, with the maximum depth x velocity product (0.4m^2/s) satisfied for overland flow routes throughout the site.

Appendix A. Water Quality 'MUSIC' Model

Proposed MUSIC Model



Appendix B. Water Quantity 'DRAINS' Model

Proposed DRAINS Model