

# UPPER TOONGABBIE CREEK FLOOD MITIGATION STRATEGY - STAGE 1

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## Abstract

Blacktown City Council planned and constructed the Sierra Place Basin in the upper reaches of Toongabbie Creek in the late 1980s. The retarding basin was intended to both lessen the flood liability of industrial properties adjacent to Toongabbie Creek downstream of Old Windsor Road and to improve the performance of the downstream McCoy Park Basin. However, due to subsequent uncontrolled upstream developments in the intervening years, it is now known that the basin would be overtopped by floods in excess of the 10% AEP event.

The UPRCT examined a number of flood mitigation options including raising the existing embankment or the construction of additional retarding basins upstream of Sierra Place leading to the adoption of a flood mitigation strategy for the Upper Toongabbie Creek. Stage 1 of the Strategy comprises four packages of works. The works for Packages A1, A2, B1 and B2 are outlined. Packages A1 and A2 have already been constructed. The issues that arose during the construction of these packages and the lessons for Packages B1 and B2 are discussed.

It is concluded that when the Stage 1 works are completed that the flood levels in the Toongabbie Creek and in the confluence area will be reduced and that these reductions will benefit the industrial area downstream of Old Windsor Road and over 300 residential properties in the confluence area that are currently flood liable.

**Key Words: Flood mitigation, Retarding Basin, Floodway, Levee, Construction**

## Introduction

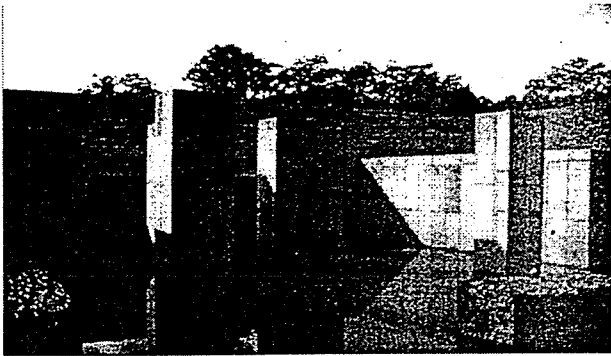
With the agreement of Baulkham Hills Council, Blacktown City Council planned and constructed the Sierra Place Basin in the upper reaches of Toongabbie Creek. The retarding basin was intended to both reduce the flood liability of industrial properties adjacent to Toongabbie Creek downstream of Old Windsor Road and to enhance the performance of the downstream McCoy Park Basin.

An initial design for the Sierra Place Basin was prepared in 1984 and model tested. An evaluation of the recommendations of initial model testing and of a NSW DSC review led to the re-design of the retarding basin (Willing & Partners, 1986).

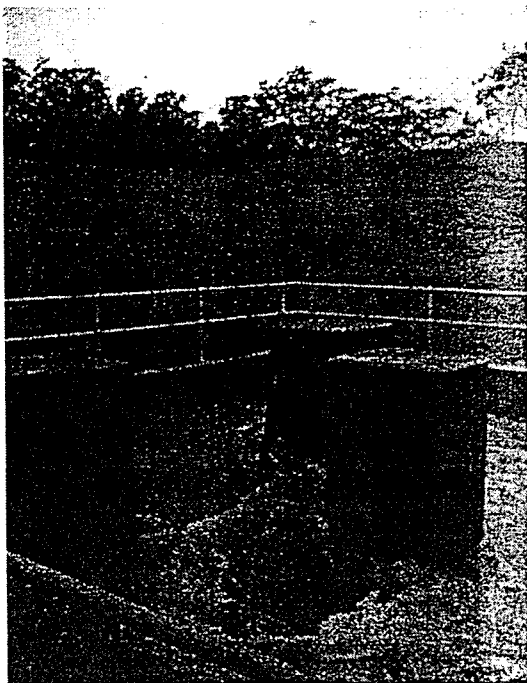
A number of hydraulic constraints were overcome by adopting an arrangement comprising of a major box culvert outlet to discharge up to 130 m<sup>3</sup>/s and an embankment which was designed to resist overtopping flows up to the 0.0001% AEP flood (Phillips et al, 1990).

Noteworthy features of the final design included (Willing & Partners, 1988):

- (i) the hooded inlet to the box culvert outlet which was found to significantly reduce vortex formation,
- (ii) an outlet structure comprising five 4 m high concrete impact columns within a 10 x 10 m concrete basin with a further 20 m of gabion protection works which significantly reduce and evenly spread flow velocities (see Plates 1 and 2), and
- (iii) RCC protection of the embankment to resist erosion due to overtopping during extreme



**Plate 1 Sierra Place Basin Outlet Energy Dissipator**



**Plate 2 Sierra Place Basin Outlet during a Flood**

However, due to subsequent upstream developments in recent years, it is now known that the Sierra Place Basin would be overtopped by floods of less than 10% AEP. The overtopping of Sierra Place Basin would in turn the McCoy Park Basin embankment to overtop several kilometres downstream, flooding scores of nearby homes and placing the structure in jeopardy.

At Sierra Place Basin a secondary embankment also protects six low-lying properties in Valerie Avenue from inundation. It consists of a 91 m earthen levee (maximum height of 1.5 m), and a 81 m cantilevered reinforced concrete retaining wall with a maximum height of 5.5 m.

In the mid 1990s the Upper Parramatta River Catchment Trust (UPRCT) examined a number of flood mitigation options, including the construction of additional retarding basins upstream of Sierra Place, raising the Sierra Place basin embankment and the secondary levee and construction of a high level floodway downstream of the confluence of Greystanes Creek and Toongabbie Creek. The need to maintain the hydraulic capacity of Toongabbie Creek to protect existing flood-labile properties was also considered.

The outcome of this assessment was the adoption of a flood mitigation strategy for the Upper Toongabbie Creek. The components of Stage 1 of the Strategy are (see Fig 1):-

- A1 Construction of a high level floodway in Sue Savage Reserve, Toongabbie;
- A2 Filling of the Golf Driving Range on Gibbons Road, next to the Sierra Place Basin;
- B1 Raising of the main embankment of the Sierra Place flood retarding basin at West Baulkham Hills by 2.5 m; and
- B2 Raising of the secondary levee of the Sierra Place basin which protects low lying properties in Valerie Avenue by 1.5 m.

Packages A1 and A2 have been completed. Packages B1 and B2 are currently being tendered. Each of these packages is outlined in turn.

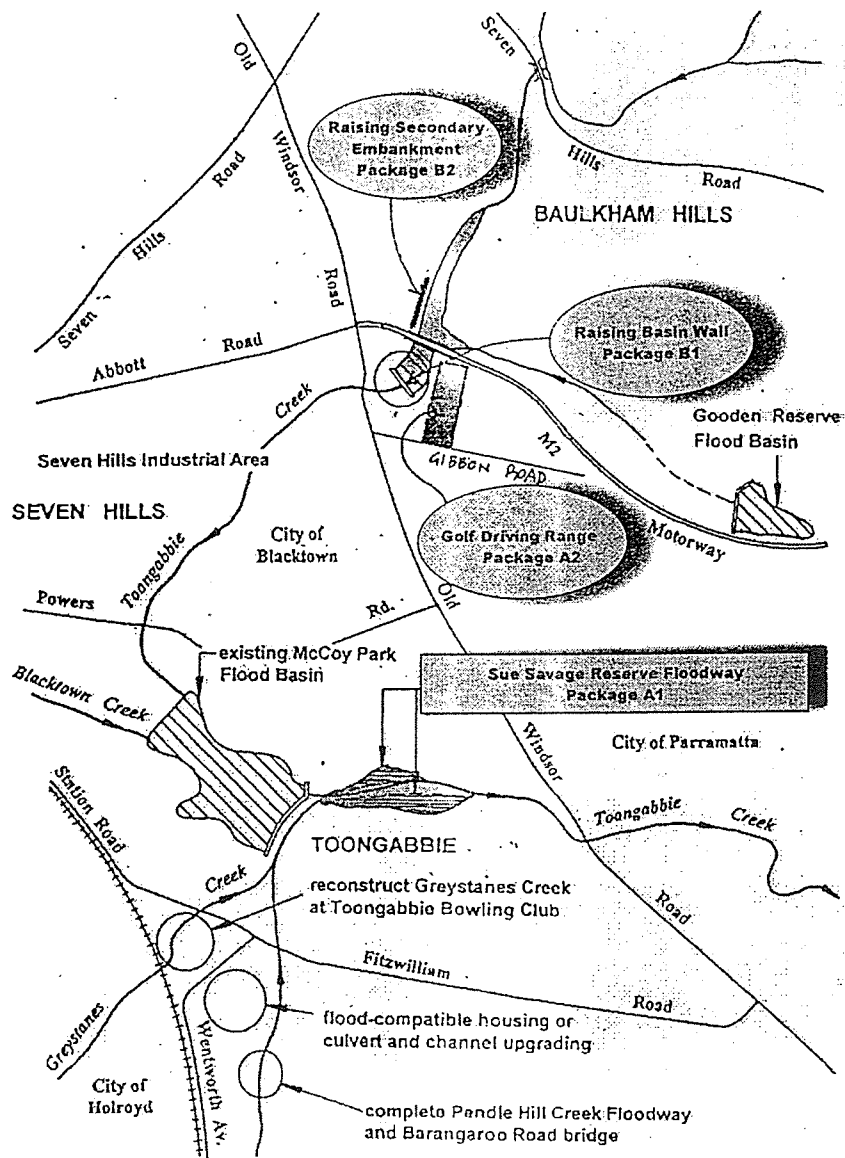


Figure 1 Schematic View of Upper Toongabbie Creek Flood Mitigation Strategy – Stage 1

### Sue Savage Reserve High Level Floodway, Toongabbie (Package A1)

The flood levels in the Toongabbie Creek confluence area have been partially lowered by excavating a high level floodway downstream of the McCoy Park Basin through Sue Savage Reserve. Material excavated from the floodway was used to raise the existing levee along Chanel Street and to raise the Golf Driving Range next to the Sierra Place Basin. High level floodways were constructed on the northern and southern banks of Toongabbie Creek.

The southern floodway is 690 m in length with an average width of 70 m. The northern floodway is 300 m in length with an average width of 25 m. The works involved the excavation of a total of 70,000 m<sup>3</sup> of material.

The Package A1 works also provided an opportunity to improve the amenity of the Reserve by landscaping the area and integrating it into an open space strategy prepared by Parramatta City Council.

The full reductions in flood levels will be achieved when the Sierra Place retarding basin works (Package B) are completed.



**Plate 3 Floodway under Construction on Southern Bank of Toongabbie Ck**



**Plate 4 Floodway under Construction on Northern Bank of Toongabbie Ck**

Construction of Package A1 commenced mid-October 1998 on the south side of Toongabbie Creek. The contractor used two scrapers to carry out the bulk earthworks, a grader to trim the final surface levels and water cart for dust control. Soil removed from the site was loaded into tip trucks with trailers and carted off-site to the Golf Driving Range.

The bulk earthworks took two and half months to complete including down time for wet weather. The final shaping and landscaping was undertaken after work-as-executed levels were taken to confirm the final floodway profile. Work on the north side commenced in late January 1999 and took two months to complete. The excess soil from this location was trucked to Aquilina Reserve at Eastern Creek which was some 12 kilometres away. Access to the south side was initially by a creek crossing with all the trucks leaving the site along Tucks Road. Some complaints were lodged with Council by the local residents complaining about the trucks arriving at the site and waiting for the gates to open.

Whilst work did not commence until the approved working hours, the truck drivers would often arrive an hour early and sit with the trucks idling until work started on the site. Heavy equipment arriving on site in the early hours of the morning to suit RTA floating requirements also gave rise to complaints from residents. Whilst the operational hours were within the statutory limits the off-site activities were harder to control. Liaison with the local residents was a critical aspect of the project to ensure the works were finished with minimal disruption to the local residents.

During the construction period there were a number of heavy storms that resulted in flooding of the creek up to the top of bank level. No soil or sediment was lost into Toongabbie Creek as a result of the earthworks and/or storm events.

#### **Raising the Golf Driving Range, West Baulkham Hills (Package A2)**

The majority of the remaining fill from excavation at Sue Savage Reserve was used to raise the Golf Driving Range adjacent to the Sierra Place Basin to substantially reduce the risk of inundation and to raise the eastern abutment of the Sierra Place basin embankment prior to undertaking works to raise the main embankment wall by 2.5 m (Package B1).



**Plate 5 Filling on the Golf Driving Range**

The Package A2 works included raising the level of the whole site by an average 1.5 m, shaping of the final surface to create several "greens", re-establishing the tees and re-grassing of the driving range.

## Raising Sierra Place Basin, West Baulkham Hills (Package B1)

The proposed Stage 1 works include raising the main embankment of the Sierra Place Flood Retarding Basin by 2.5 m.

A range of options were identified for ways to raise the main embankment. Concept layouts and cost estimates were prepared for nine options (Willing & Partners – Thompson & Brett Consulting Group, 1996). The adopted option is to raise the main embankment by installing pre-cast CSR-Humes "Doublewal" units (filled with gravel) on the crest of the embankment up to the required height and undertaking associated protection works on adjacent properties.

## Raising the Secondary Embankment (Package B2)

Works on the Valerie Avenue secondary embankment include the raising of the existing retaining wall and construction a new wall to the south and north of the existing one. This will bring the height of the wall up to 45.5 m AHD which will provide 500 mm of freeboard above the raised 1% AEP basin flood level.

The concrete wall will be raised 1.5 m by constructing an additional vertical wall section and adding strengthening counterforts. The existing wall is also to be extended at either end to prevent floodwaters outflanking the structure. Downstream of the existing wall, an extension following the crest of the existing levee is proposed.

## Conclusion

It is concluded that when the Stage 1 works are completed that the flood levels in the Toongabbie Creek and in the confluence area will be reduced and that these reductions will benefit the industrial area downstream of Old Windsor Road and over 300 residential properties in the confluence area that are currently flood liable.

## Acknowledgement

The permission of the UPRCT to outline the Upper Toongabbie Creek Flood Mitigation Strategy is gratefully acknowledged. The views expressed in the paper are those of the authors and are not necessarily the views of the Trust.

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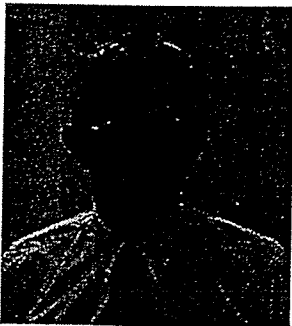
## Author Biography



**Dr Brett C. Phillips** is a Director of Willing & Partners with more than 15 years of experience in a wide range of hydro-environmental projects. He led the team that investigated the options that led to the adoption of the Stage 1 works. He was also the Keynote Speaker at the 38<sup>th</sup> FPMA Conference in Moama.

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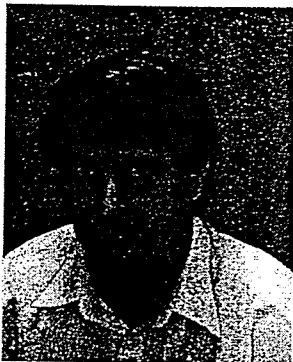
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