MID MURRAY COUNCIL

Truro Stormwater Management Plan

Final Report

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1 Introduction

1.1 Background

Australian Water Environments were engaged by the Mid Murray Council to develop a stormwater management plan for Truro.

Stormwater management plans (SMPs) are a way of helping councils and other catchment managers to recognise the impacts of activities within their boundaries and to develop best practice management strategies and programs. The SMP is used to inform the plans, strategies and policies of local catchment managers.

The SMP has been developed through a two stage process with the first stage being the development of an Integrated Water Management Plan, (AWE, 2008). The Integrated Water Management Plan (IWMP) took a holistic view of all the water issues in Truro and involved extensive consultation with council staff, elected members and the community of Truro. The consultation process was used to identify the community vision and objectives for all water management including stormwater management. It was through this consultation process that the community and council identified improved management of stormwater and flood water as being of highest priority with wastewater management also being considered very important.

The main scope of the Truro Stormwater Management Plan study was therefore to build a better understanding of the current drainage regime of the township, develop strategies to alleviate existing problems, identify water quality improvement opportunities and potential opportunities for reuse of stormwater.

1.2 Legislative and Policy Context

The Local Government (Stormwater Management) Amendment Act 2007 came into operation on 1 July 2007. This established the Stormwater Management Authority and new financing and governance arrangements for stormwater management and flood mitigation throughout South Australia.

The Authority implements the Stormwater Management Agreement and operates as the planning, prioritising and funding body in accordance with the Agreement. The Stormwater Authority is charged with:

- Working with Councils to facilitate and coordinate catchment stormwater management planning;
- Allocation of State funding to projects in coordination with council and other sources of financing; and
- Facilitating cooperative action by all relevant public authorities in the planning, construction and maintenance of stormwater management works.

The framework established by the Stormwater Management Act requires Councils to prepare stormwater management plans on a catchment basis, and to implement infrastructure works in accordance with the catchment plans. The Mid Murray Council aims to implement this policy and legislative initiative via the development of Stormwater Management Plans across its area.

The process and content by which Stormwater Management Plans are developed have been formalised by the State Government via the Stormwater Management Authority in a guideline entitled Stormwater Management Planning Guidelines. The Guidelines specify that Stormwater Management Plans must contain the following:

- Objectives and outcomes for management of stormwater in the catchment;
- Strategies to meet specified management objectives for the catchment;
- A definition of the area to which the plan applies;
- A description of all known existing stormwater assets, including identification of current condition and ownership where known;
- An identification of stormwater management problems and opportunities for achieving outcomes for public and environmental benefit in the catchment;
- Determination of capital and maintenance (including recurring) costs associated with the management strategies and how those costs will be apportioned between Councils and government agencies if relevant;

- An assessment of the benefits to be derived by implementation of the proposed management strategies;
- Prioritisation of the strategies and a timeframe for implementation;
- Assignment of responsibilities for implementing the strategies and meeting any costs;
- Relevant implications of any of the above for adjoining catchments;
- A communication / consultation strategy for the plan; and
- Impact of the plan on the environment, economy, community and water resources management in the catchment(s) affected by the plan.

South Australia's legislative framework provides a number of other tools legislative and policy tools to address water management ranging from state-wide legislation to regional and local policy.

One of the key mechanisms for achieving the desired outcomes of integrated water management is to ensure that the objectives of the Stormwater Management Plan meet and contribute to other State and National Natural Resource Management policies and strategies. These strategies in turn assist in the implementation of the desired water management outcomes in Truro.

The SMP can also be used to provide guidance to the plans, strategies and policies of local catchment managers.

2 Description of SWMP Study Area

2.1 Background

Truro is a regional town located on the eastern outskirts of the Barossa Valley approximately 15km north east of Nuriootpa on the Sturt Highway. The population of the township is approximately 350.

The township is located adjacent to the ephemeral Truro Creek running from west to east through the township. The area around Truro is hilly with the township located in the valley between hills to the north and south. The area north and south of Truro Creek has been developed primarily for residential dwellings.

Truro Creek has a catchment area upstream of the township of approximately 620ha. The creek runs through the township south of the Sturt Highway/Murrundie Street but crosses under the Sturt Highway to west of the township through two box culverts.

The existing drainage network consist of a limited piped drainage system, primarily located on Moorundie Street and discharging to Truro Creek. There is no existing underground drainage infrastructure on the southern side of Truro Creek.

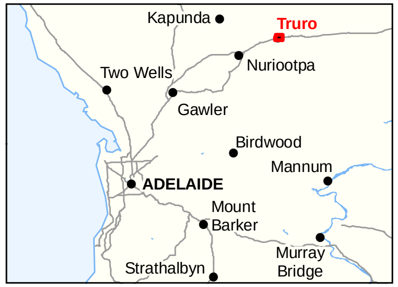
Significant flooding has been recorded at Truro in 1983, 1992 and 1999. These events all caused significant flooding of the Moorundie Street/Sturt Highway. The flooding in all cases was as a result of local runoff from the slopes surrounding Truro rather than from Truro Creek itself.

2.2 Study Boundary

The area analysed in the current extent hydrological model was defined by the extent of the survey and the catchment area which feeds into the township on the northern side of the Truro Creek, as shown in Figure 1.

2.3 Climate

The mean annual rainfall of Truro is 494mm. The monthly average distribution of rainfall and annual rainfall over the available record in Truro is summarised in the table that follows. Also summarised is the monthly evaporation characteristics for the area.



LEGEND

Watercourse

Cadastre

Study Boundary

Data Source:
Study boundary from AWE;
Cadastre from Mid Murray Council;
Streams digitised from aerial photography;
Aerial photography from Google Earth (14/01/2010).

0 150 300 450
Metres

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Truro Stormwater Management Plan

Study Boundary

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100114

Figure 1

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Annual*
Evaporation*	270	234	192	111	65	42	47	65	93	146	198	245	1708
Rainfall (mm)	20.7	20.2	22.8	37.3	52.5	60	59.4	63.3	54.2	45	31.5	27.4	494
Average Maximum Daily Temperature*	28.8	28.6	25.7	21.4	17	14.2	13.2	14.3	16.8	20.2	23.8	26.3	20.9

*Nuriootpa Comparison data 14km from Truro

Most precipitation occurs in the 6-month period between May and October. The total precipitation in this period is distributed relatively evenly across each month. The lowest rainfall occurs in the summer months of January, February and the first month of autumn, March.

2.4 Potential for Urban Growth

Truro has been largely developed within the existing development plan and expansion of the township boundaries (and subdivision) is currently constrained by the failing wastewater management systems (or lack thereof).

The current Truro Township's (see Figure 2) capacity for infill development is along an existing Department of Transport Energy and Infrastructure rail corridor. The railway line has been removed and the land is now currently vacant. This land has been kept under DTEI management whilst it reviews its needs for a bypass for the Sturt Highway around Truro.

3 Existing Stormwater Infrastructure

3.1 Existing Infrastructure

Truro has limited stormwater drainage infrastructure. The main stormwater conveyance device for the town is via roadways and open channel drainage. Aside from the Sturt Highway there is limited underground stormwater infrastructure. Most minor roads have table drains in the road verge rather than kerb and channel. There is no formal underground drainage infrastructure on the southern side of the Truro Creek with water draining to Truro Creek directly. The catchment map for the Truro Stormwater Network is shown in Figure 3.

A survey of the township was undertaken to record stormwater information on formal stormwater infrastructure. Information on pipe size, invert level, pipe lengths and pit details has been recorded in a GIS database.

The survey undertaken identified the location and size of the pipe infrastructure. In most locations junction boxes were not visible and none were accessible. Consequently, the precise location, configuration and invert levels of the drainage system were estimated from examining the survey information and an understanding of the drainage configurations. Therefore there is some level of uncertainty in the drainage capacity indicated in the hydraulic model.

There are four major underground networks, each containing multiple pits and pipes. All other pipes are single pipes such as culverts under roads. Stormwater infrastructure including pipe and open channel flow paths (excluding roadside) drainage is shown in Figure 4. Below is a description of the drainage infrastructure of Truro.

a) Truro Creek

Truro Creek is an ephemeral stream that runs through the centre of Truro on the south of the Sturt Highway. This stream receives runoff from the Truro Township but the largely agricultural upstream catchment contribute the bulk of the runoff. The upstream catchment is approximately 620ha. Truro Creek is conveyed under the Sturt Highway on the western edge of Truro via two 3.8 by 1.75m box culverts.

LEGEND

	Watercourse	**Development Zones:**	
	Study Boundary		*Country Township*
	Cadastre		*Rural Living*
			Rural

Data Source:
Study Boundary from AWE;
Cadastre from Mid Murray Council;
Streams digitised from google earth imagery;
Development zoning data from Mid Murray Council;
Imagery from Google Earth.

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Truro Stormwater Management Plan

Truro Zoning - Mid Murray Council Development Plan

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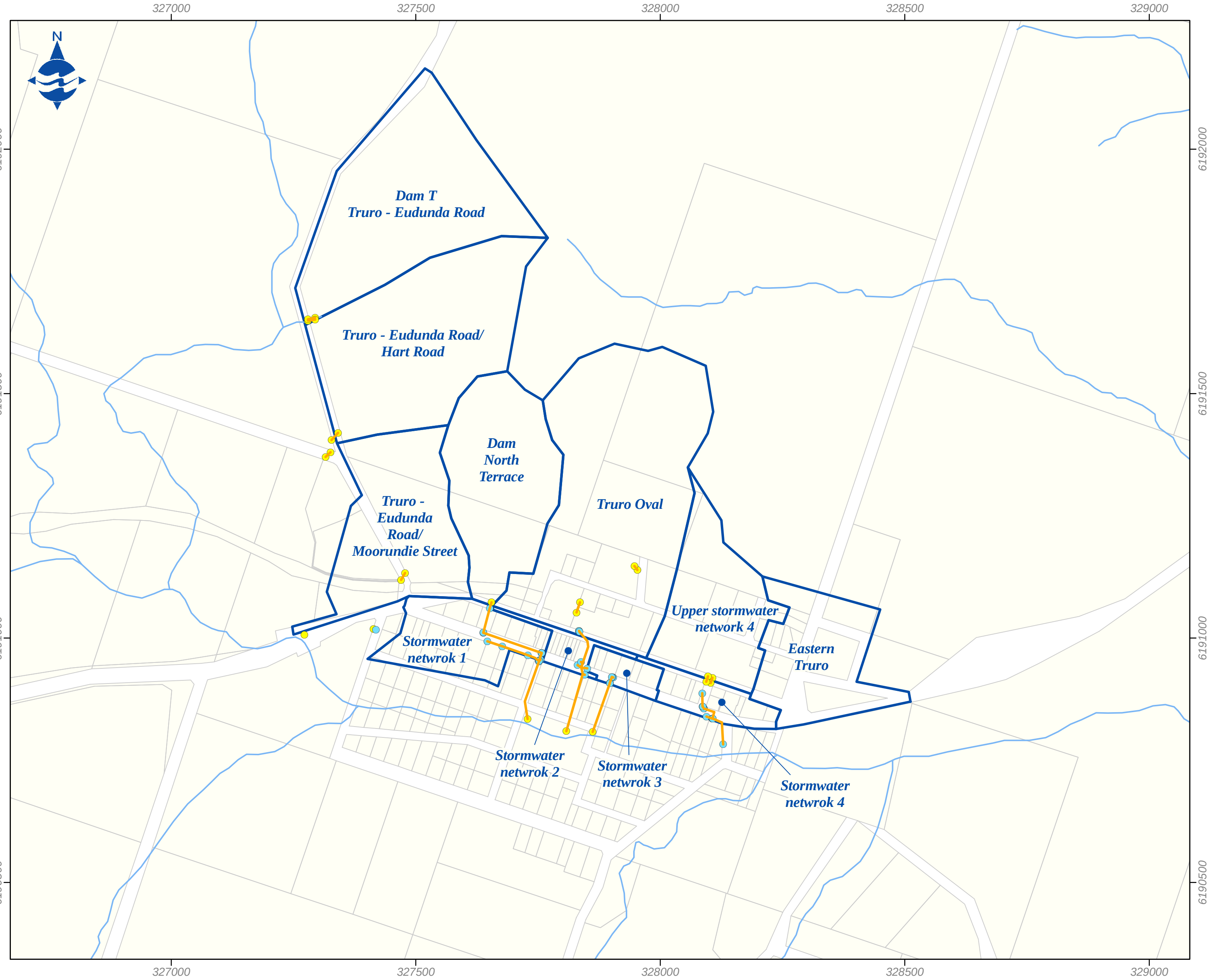
100114

Figure 2



LEGEND

- Side Entry Pit
- Head Wall
- Pipes
- Watercourse
- Catchment Boundary, with catchment name
- Cadastre

Data Source:

Study Boundary, catchments, side entry pits, head wall and pipe data from AWE;
Streams digitised from google earth imagery;
Development zones and cadastre from Mid Murray Council.

0 150 300 450
Metres

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Truro Stormwater Management Plan

Truro Catchment Map

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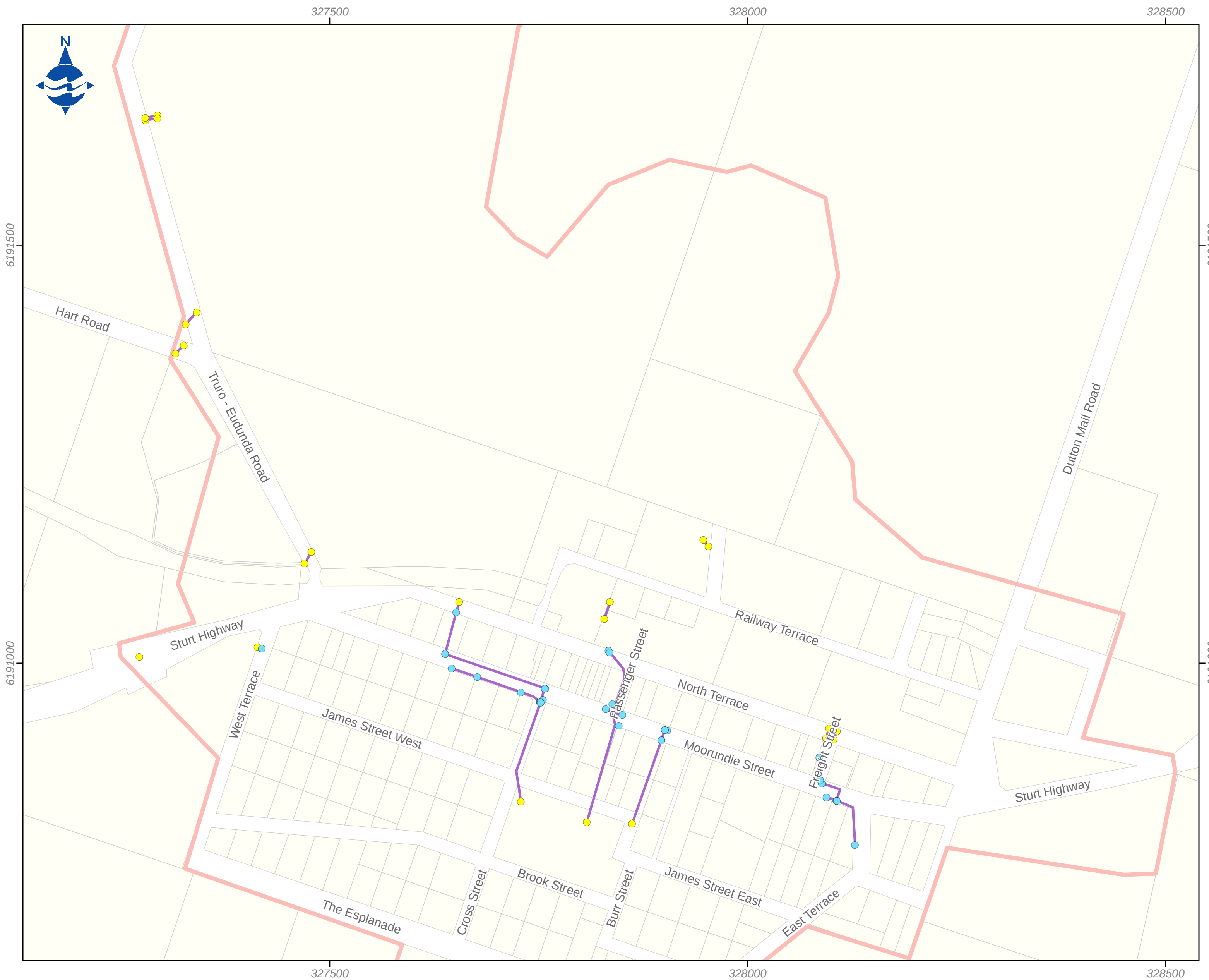
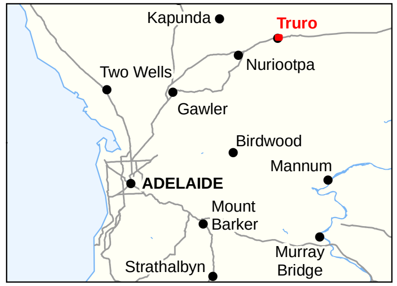
100114

Figure 3





LEGEND

- Side Entry Pit
- Head Wall
- Pipes
- Study Boundary
- Cadastre

Data Source:

Study Boundary, side entry pits, head wall and pipe data from AWE;
Cadastre from Mid Murray Council.

0 100 200 300
Metres

Australian WATER Environments

Truro Stormwater Management Plan

Existing Truro Stormwater Network

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100114

Figure 4

b) Farm Dam and Culvert on Truro-Eudunda Road

Culverts are located under the Truro-Eudunda Road approximately 250m north of the junction with Hart Road. At this location is a farm dam. The overflow is directed to the culverts under the road to a second farm dam, then via an overland flow path to Truro Creek. There are twin 1.2m by 0.6m box culverts and a 450mm diameter pipe which is older and has an invert 0.25m higher than the newer box culverts. If the culvert capacity is exceeded overflow is along the Truro-Eudunda Road towards Truro.

c) Truro-Eudunda Road and Hart Road Intersection Culvert

At the intersection of Truro-Eudunda Road and Hart Road are a series of culverts. These culverts allow runoff from the rural catchment to cross the Truro-Eudunda Road via a 525mm diameter pipe and Hart Road via a 600mm pipe. There is some initial detention storage provided upstream of the Truro-Eudunda Road culvert and additional storage in the agricultural land downstream of the culvert. If the first culvert and storage capacity is exceeded water surcharges and is conveyed along the Truro-Eudunda Road towards Truro.

d) Truro-Eudunda Road, Sturt Highway and North Terrace Intersection Culvert

A culvert located at the junction of North Terrace, Truro-Eudunda Road and Moorundie Street, conveys stormwater under the Truro-Eudunda Road. The catchment area for this road includes the overflows from the two culverts on the Truro-Eudunda Road and some additional rural catchment. This culvert is directed to an overland channel which drains to Truro Creek. Overflow from the culvert continues down Truro-Eudunda Road and onto North Terrace. The channel defining the flow to North Terrace is not pronounced and there is potential for flows to overshoot the intersection and flow to the Truro town centre.

These culverts were choked with sediment when inspected.

e) Western Moorundie Street Channel to Truro Creek.

An informal channel in the road verge conveys water from the intersection with Truro-Eudunda Road and discharges to Truro Creek directly upstream of the Sturt Highway culvert over Truro Creek.

f) Farm Dam North of North Terrace

The farm dam, while not operated for flood mitigation (no low level outlet) does provide some mitigation due to the storage and throttling of flow through the spillway.

g) Stormwater Network One

This is the western most drainage system on the Sturt Highway, it collects water from North Terrace and the Sturt Highway. The pipe discharges to the Truro Creek directly east of Cross Street.

The first element of this system is located below the farm dam north of North Terrace, where a 375m pipe and head wall is located in a depression in the road verge. Runoff to this location is overflow from the dam and water flowing on the northern verge of North Terrace.

A side entry pit (SEP) is located on the southern side of the North Terrace which collects water from the southern side of the road. Any overflow continues eastward along North Terrace. The pipe runs through a drainage easement to the Sturt Highway.

There are several SEPs located on Sturt Highway on each side of the road. A pit at the southern end of the drainage easement from North Terrace is the most westerly SEP. From the northern SEP a 600mm pipe connects to a junction box on Cross Street. From this pit a 525mm pipe runs east along the northern side of the Sturt Highway to a SEP at the intersection with Cross Street. There are three SEPs on the southern side of the highway connected to a 525mm pipe running on the southern side of Moorundie Street west of Cross Street. A SEP on the south east corner connect directly to the junction box.

From the junction box a 900mm pipe runs along the eastern side of Cross Street and discharges into Truro Creek.

h) Truro Oval/DTEI Railway Easement

Stormwater from the agricultural land above the Truro oval is discharged south of the oval via two drainage paths conveying runoff across Railway Terrace. One is located on the western side of the tennis courts and the other on the eastern side of the main entrance. Both channels convey flow across Railway Terrace to informal channels that run south through the DTEI's railway easement. Along the western channel there is a 600mm diameter culvert which is a remnant from the old railway line. Both Channels connect to the underground drainage network at the junction of North Terrace and Passenger Street.

i) Stormwater Network Two

Stormwater from the Truro Oval catchment flows into stormwater network two. The western channel through the DTEI easement arrives at a headwall with a 750mm diameter pipe adjacent to North Terrace. Overflow from this channel is directed to SEP located in a sag on North Terrace. This SEP also collects water from the eastern channel and from the northern side of North Terrace.

Overflow from the SEP located on the northern side of North Terrace surcharges to Passenger Street. There are 4 SEPs located at the junction with Passenger Street and the Sturt Highway. Two located on the north western corner (with one SEP on each street), a third on the north eastern corner (on the Sturt Highway) and the fourth on the southern side of the Sturt Highway. Each connects separately to the trunk main which runs through a drainage easement on land adjacent to the Pioneer Park site and discharges to Truro Creek. Overflow from the SEP continues east along the Sturt Highway. With the proposed development of Pioneer Park some of the kerb flow on the southern side of the highway will be diverted through Pioneer Park.

j) Stormwater Network Three

Stormwater network three is located in the western sag of the Sturt Highway (adjacent to the bakery). Two pits are located on the northern side and a single pit on the southern side. The pits a connected via a 375mm pipe. The pipe from the southern pit is connected to a junction box where a larger pipe runs through a drainage easement and discharges to Truro Creek.

k) North Terrace/Freight Street Culverts

At the North Terrace Freight Street intersection are two 300mm diameter culverts (one located on each side of Freight Street). The culverts are located in a sag. Overflow is directed down the eastern side of Frieght Street.

l) Stormwater Network Four

Stormwater network four is located in the sag on the Sturt Highway near the Freight Street. A field inlet is located on the western side of Freight Street. There are two additional pits located on the north eastern corner of the intersection (one SEP on each road). Overflow from these pits is to the east where there is a pit located in the sag.

On the southern side of the Sturt Highway there are two additional pits. One pit is located in the sag and the other approximately 15m to the west. Flow entering the sag pit is directed to Truro Creek. Overflow from the sag pit enters private properties on the southern side of the Sturt Highway.

4 Stormwater Management Objectives

The stormwater management objectives for this plan were developed with consideration the wide variety of interests (and requirements) involved in urban development. Key stakeholder involvement in this process was identified as being critical to ensuring that the SWM Plan was developed taking into consideration the stakeholder organisation's requirements and needs and will achieve the important water management outcomes sought by this project.

The Council and the Project Team considered that a range of organisations have an important role to play in contributing to the creation of an innovative yet practical plan for improving the way water is managed in Truro.

The following organisations were consulted during the early stages of the project (ie during the development of the Integrated Water Management Plan).

- Mid Murray Council Staff;
- Environment Protection Authority;
- Department of Health;
- SA Water;
- Department of Water, Land and Biodiversity Conservation;
- Department for Transport, Energy and Infrastructure;
- Local Government Association;
- Stormwater Management Authority; and
- South Australian Murray Darling Basin Natural Resources Management Board.

The consultation was utilised to:

- Inform agencies and organisations of the water management intentions of Truro;
- Determine if there were any additional sources of information or reports that had not been considered;
- Obtain information regarding any current (or future) amendments to legislation, policies, approval processes or codes of practice which may need to be considered in the development of the plan; and
- Determine if there were any opportunities for joint water management.

Details of the purpose and outcomes of the consultation with each of the above organisations is provided in Appendix D.

In addition, a workshop was held with the Truro community in order to:

- Outline the objectives and the approach to development of the Plan;
- Outline the progress of the development of the Plan; and
- Involve the Truro community in the development of the SWM Plan.

The main issues identified by the workshop participants with regards to water and wastewater management included:

- Stormwater pollution entering Truro Creek;
- Flooding;
- Lack of maintenance of stormwater infrastructure;
- Disposal of septic tank wastewater is difficult;
- Water management issues hindering potential future development opportunities

The main aspirations identified by the workshop participants with regards to water and wastewater management included:

- Reduce the reliance on the River Murray;
- Eradicate non-native plant species;
- Cost effective solutions developed to alleviate the impacts of flooding;
- Wastewater is managed;
- Strategy in place for use of excess water (including treated wastewater);
- Grants obtained to complete water management projects;
- Education and encouragement to reduce the levels of pollutants.

The Truro Project Advisory Committee was the main community group that were involved and supported the development of the Integrated Water Management Plan. This committee continues to meet and has regular input and contact with Council as part of councils community committee structures.

For this reason the development of the SWM Plan has continued to involve this committee as well as council staff.

Through the above consultation process and technical assessments the following stormwater management objectives have been developed for Truro.

- To provide an acceptable level of protection of both public and private assets from flooding;
- Management of the quality of runoff to minimise adverse impacts on receiving waters;
- Promote the beneficial use of stormwater;
- Improve the condition of Truro Creek and riparian ecosystems that rely on it;
- Use the planning system to achieve desirable outcomes for new development, open space, recreation and amenity;
- Sustainable management of stormwater infrastructure including maintenance is achieved.

The specific goals that have been developed for the Truro as a result of these objectives have been grouped into three areas: Flood mitigation; Water Quality; and Water Reuse.

- Flood Mitigation
  - No flooding of public or private property occurs for any event up to and including the 1 in 100 ARI event.
  - Flood protection is provided so that the Truro road network meets safe flow requirements including depth, width and depth x velocity targets for minor and major flows.
  - Maintain infrastructure (eg pits, culverts, traps and pipes) so that they remain functional and effective.
- Water Quality
  - To provide treatment of stormwater runoff from the township prior discharging to Truro Creek
  - Stormwater discharging to Truro Creek meets stormwater quality objectives.
  - Stormwater treatment systems must not compromise flood mitigation measures
- Water Reuse
  - Promote the reuse of stormwater to provide a beneficial use for Truro without compromising flow management or flood mitigation infrastructure.

5 Drainage Deficiencies & Opportunities

5.1 Introduction

Truro has a history of destructive flood events with roads and buildings being damaged in the recent past.

Anecdotal information indicates that flood damage is generally associated with flows from the catchments to the north of the town. Flows from the creek do not appear (from past experiences) to cause flood damage in Truro.

One of the most significant events occurred on the 3-4 March 1983. During the event the highway between Blanchetown and Truro was closed for 4 days (Casperson, 2006). The damage to council property was estimated at over $165,000 (in 1983) with anecdotal evidence suggesting it was the worst flooding event in over 50 years (Leader newspaper circa. March 1983 Truro District Council Report $163,289 Damage from Flood (pers com. Ross Dawkins and Reg Munchenberg).

There have been more flood events since with the main ones being in 1992, 1999 and 2004. Interestingly all these floods were in the month of December.

5.2 Observed Drainage Deficiencies

Drainage deficiencies have been observed during pervious storm events as private and public properties have been subject to flooding. The identified deficiencies have been used to help the calibration of the modelled catchment.

a) Truro-Eudunda Road Culverts

The culverts were found to have been under capacity is some of the previous flooding events,.However, the culverts at both the northern dam and at the intersection with Hart Street have both been upgraded since previous flooding occurred. This extra capacity reduces the overflow from these culverts and provides some mitigation of flows arriving at Truro. An earthen spillway exists from the farm dam to the culverts. The design basis for this dam and spillway is unknown, and hence its integrity under flood flow conditions should be checked.

b) North Terrace/Truro Eudunda Road

The culvert under Truro-Eudunda Road at the intersection with North Terrace has also been identified as under capacity.

The failure of this culvert dramatically alters the flow path of stormwater. Flow through the culvert is directed towards Truro Creek, but when the capacity of the culvert is exceeded overflows follow Truro-Eudunda Road into the township.

The performance of this culvert is further compromised by the large amount of silt that has accumulated in the culvert.

c) Western Moorundie Street channel to Truro Creek

The channel on the northern side of Moorundie Street from Truro-Eudunda Road under capacity. Overflow occurs across Sturt Highway to low point West Terrace where stormwater ponds.

d) North Terrace

Stormwater runoff on North Terrace is conveyed along table drains in the road verge. These drains are under capacity. On the southern side this leads to overflows occurring through private properties.

e) Passenger Street

Passenger Street is a major drainage route for Truro. The pipe under Passenger Street is not being fully utilised as pipe capacity exceeds that of inlet structures. As a result, overflow is directed down the road and exceeds the capacity of the kerb and channel system. In addition, the connection from North Terrace is not well defined potentially leading to flows being directed down the footpath.

f) Railway Terrace

Overland flow from the oval and the catchment upstream crosses Railway Terrace at two locations, on either side of the recreation courts. The eastern crossing has previously had overland flow entering the property causing flooding.

g) Sturt Highway

There are two sag points in the Sturt Highway as it runs through Truro and properties adjacent to these sag point have had a history of flooding. The drainage from the Sturt Highway in both these locations is under capacity. There are currently no formalised overland flow paths and property boundary levels are lower than potential overland flow paths along the roadway or public land.

The western sag point is approximately 50m east of Passenger Street. This location has a substantial catchment including the oval catchment and from any flow that is not conveyed through culverts beneath Truro-Eudunda Road. The pit at this location is under capacity and in previous flooding events significant blockage of this pit has been observed. Pooling on Sturt Highway at the sag point causes water to backup and flow towards the other SEPs on the Sturt Highway. These other SEPs are not able to convey the additional and hence become inundated. Residential properties are located adjacent to this low point and water can enter the properties before water can be conveyed from the site via the formally designated flow path through Pioneer Park. The redevelopment of Pioneer Park has a central roadway which is a preferential flow path. However, this path does not have sufficient capacity and inundation of properties could still occur in on a frequent basis (eg from a 1 in 10 ARI event).

A second drainage deficiency on the Sturt Highway is at the low point between Freight Street and East Terrace. This area has a relatively small catchment, however there are no dedicated overland flow paths. All flow is required to be discharged via the piped network otherwise water will pond and overflow through private property.

h) West Terrace

A local depression on West Terrace has limited overflow capacity, A 275mm diameter pipe connects each side West Terrace, another 275mm pipe connects to the neighboring property where it runs via an overland drain to Moorundie Street on the eastern side of the motor repaor shop. However, due to its small size this pipe is commonly blocked..

5.3 Hydraulic Modelling

The DRAINS modelling platform (www.watercom.com.au) was used to undertake the hydrological/hydraulic modelling and analysis of the study area. DRAINS is a windows-based program for designing and analysing urban stormwater drainage systems. DRAINS utilises the time-area hydrological method.

DRAINS models consist of nodes and drainage links. The nodes represent infrastructure such as stormwater entry pits, grates and junction boxes. The drainage links represent items such as pipes, channels and overflow paths. Catchments are used to designate the inflow of water into the nodes. Catchment data required by the model includes percentage pervious and impervious area, times of concentration, lag time and total catchment size.

The model was intended to give an indication of drainage deficiencies created by stormwater runoff generated in the catchment. The model does not take into account flooding from Truro Creek and the potential effect this has on the drainage network.

The model does not indicate the extent of drainage problems across the catchment. The results indicate the location of a deficiency along a drainage path and an indicative magnitude of the deficiency. The model was not designed to create a flood map for the township.

5.3.1 Model Development

a) Stormwater Infrastructure

Stormwater infrastructure was added to the model using the from the GIS database for pit and pipe size, type, length and invert details. As many of the pits located throughout Truro are not a standard design. Individual inflow relationships were developed for each pit.

In most instances junction boxes were not able to be accessed and surveyed. Consequently some of the junction box invert levels and pipe level were estimated.

b) Overflow Paths

The survey was used to determine the overflow path direction, the morphology of the channel cross section, and ponding depth-surface area relationships at sag points. The DRAINS model uses a single cross section and slope for an overflow route. Where there were multiple cross sections available for a single overflow path, the section with the smallest capacity was selected, this provides a conservative estimate of the amount of work required to upgrade the channel.

c) Catchment Delineation

Detailed catchment analysis was undertaken using aerial imagery to determine the percentage of impervious area in the sub-catchments. Sub-catchments were defined using the topographic and built environment constraints of the town. For rural catchments the 5m contour data was used to determine catchment boundaries, slopes and flow path lengths.

The flow paths and overflow paths of the urban catchment areas were determined by site inspection. This inspection was undertaken prior to the field survey to identify areas which required additional survey determine flow directions.

Aerial photography of the subcatchments was used to determine a percentage impervious area for each catchment.

d) Hydrology

The Average Recurrence Intervals (ARIs) selected for analysis were 2, 5, 10, 20, 50, and 100 years with storm durations ranging between 5 minutes and 1.5 hours. The modelled ARIs comply with the Guidelines for Stormwater Management (Planning SA, 2001). Storm Intensity, Frequency and Duration (IFD) calculations were undertaken in AUS-IFD Version 2.0.1 following the methods prescribed in Australian Rainfall & Runoff (Engineers Australia, 2001), and included in the development of the DRAINS model.

e) Failure Criteria

Drainage standard for the study area was based on the safe depth and velocity for stormwater conveyed along the roadways. The values selected were based on standard drainage manuals. Safe depth was considered as the top of kerb height for events up to a 1 in 10 year event where kerbs are present. For roads without kerbs the entire roadway may be inundated with the maximum water level equal to the road crown. For major storms the entire road reserve width was taken. Safe flow rates vary depending on the section under consideration and are controlled by a function of the user defined Safe Depth x Velocity (m^2/s). The value of Safe Depth x Velocity selected for the Truro analysis was 0.4 m^2/s.

f) Calibration

Formal calibration was not carried out on the model because no measured flow information was available. Additionally works have been undertaken since recent flooding events. Consideration was given to the locations where flooding events has previously been observed to ensure there was some consistency with the modelling and observations.

5.3.2 Modelled Drainage Deficiencies

Modelled drainage deficiencies identified were largely in agreement with observations during previous flood events. The modelling process enabled an estimate to be made of the annual recurrence interval (ARI) of the deficiency.

The location of the deficiencies is shown in Figure 5. A description of the main deficiencies follows.

a) Truro-Eudunda Road Hart Road Culvert

The culvert under Hart Road is under capacity and there is insufficient detention area behind the culvert to mitigate flows for a 1 in 20 ARI storm. For a 1 in 20 ARI storm event the culvert capacity is exceeded and overflow from the culvert flows along Truro-Eudunda Road towards Truro.

b) Truro-Eudunda Road, North Terrace, Culvert

The culvert is under capacity for flows greater than or equal to the 1 in 20 ARI event. The failure of this culvert increases flow to locations downstream within the town that have existing drainage problems.

c) Channel from Truro-Eudunda Road to Truro Creek

The channel which runs parallel to the Sturt Highway from the culvert is under capacity for less than a 1 in 5 ARI event. The overflow from this channel is to West Terrace where water runs through an informal overland flow path at the rear of properties to Truro Creek.

d) North Terrace

A deficiency was noted at North Terrace where table drains on each side of the road are under capacity in a 1 in 5 ARI event. The capacity of the channel on the northern side of North Terrace is greater and conveys the majority of the flow. Failure of this drain leads to flow spilling over the road crest to southern table drain. At some locations along the road the embankment on the southern side is not sufficient and stormwater will overflow through properties.

e) North Terrace/Passenger Street

The SEP on North Terrace is under capacity for minor stormwater events with stormwater flowing over the crown and overland via Passenger Street. There is insufficient capacity in Passenger Street to safely convey the flow from a 1 in 5 ARI event.

f) Sturt Highway Drainage

From the model of Truro there are several locations where there will be failure of the Sturt Highway drainage system. This includes locations where desired flow width has been exceeded and/or where the flow depth is above the kerb level. For a 1 in 5 ARI event the embankments may also be overtopped causing flow through private properties.

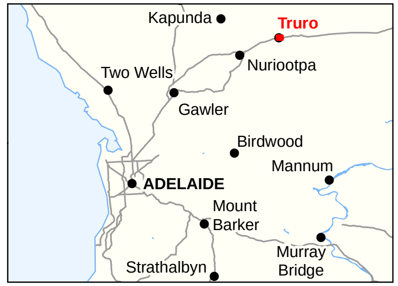
The two locations which have been identified as having a history of flooding were also found in the modelling to flood. Flooding of the Sturt Highway causes significant inundation. There is a length of approximately 60m from Pioneer Park to the SEP at the low point. The proposed development of Pioneer Park will have a road access. This will provide an additional overland flow path to Truro Creek. The predicted water levels on Moorundie Street exceed boundary levels and some flow through residential properties is expected.

The eastern sag on the Sturt Highway also has a drainage system that is under capacity resulting in flooding of private property. The sag does not have an overflow route through a drainage easements or Council property.

Much of the length of Moorundie Street kerb and channel is under capacity with the safe flow depth exceeded in minor events from Passenger Street to the east. Moorundie Street, adjacent to Freight Street, is under capacity in a 1 in 5 ARI event. Moorundie Street from Cross Street to Passenger Street is under capacity in a 1 in 10 ARI event.

g) Freight Street

Drainage on Fright Street is under capacity on the eastern side of the road. While there is currently capacity to convey flow across the entire channel, the majority of the flow is directed to the eastern kerb. Consequently, flow depth exceeds the kerb height and the drainage capacity is exceeded in a 1 in 20 ARI event.



LEGEND

- Side Entry Pit
- Head Wall
- Pipes
- Modelled Drainage Defficiencies
- Study Boundary
- Cadastre

Data Source:

Study Boundary, drainage defficiencies, side entry pits, head wall and pipe data from AWE;
Cadastre from Mid Murray Council.

0 100 200 300
Metres

Australian WATER Environments

Truro Stormwater Management Plan

Modelled Drainage Defficiencies

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Figure 5

5.4 Infill Development

Urban growth and infill may affect stormwater runoff through a catchment in a number of ways:

- Increased infill development leads to an increase in the impervious area of the catchment, potentially increasing stormwater runoff generation due to less infiltration;
- Reduced travel time of runoff to Truro due to increased channelisation and direct connection;
- There may be more point source entries into Truro Creek via stormwater outlets rather than overland flow; and
- If the current overland flow paths are exceeded the flow patterns will change, possibly with overland flow across private property areas.

Hence, infill development may potentially cause additional drainage deficiencies or exacerbate existing deficiencies.

Infill development was therefore assessed to determine the impact on the drainage system. This was done by using an increased pervious percentage (to 60%) to represent the ultimate development scenario. Areas with impermeable areas already greater than 60% were not modified. Open space / recreation areas were assumed to remain in their current condition.

A comparison of the drainage standards for safe flow and safe depth conducted for the infill development scenario showed a noted impact on the hydrology of the catchment. The frequency of system failure will increase for the infill development scenario. The safe depth for most of the length of Moorundie Street would be exceeded for a 1 in 5 year event. The safe flow depth is exceed depth would be exceed for a 1 in 2 year event between Passenger Street and the low point.

Truro has been largely fully developed for sometime and there is minimal scope for additional development according to Mid Murray Council's current Development Plan for Truro. However, the above findings indicate that infill development in Truro will still require proper procedures and planning to be in place to reduce the occurrence of future drainage issues and deficiencies in the stormwater system.

6 Flood Mitigation Strategies

Flood mitigation strategies were developed for each of the identified drainage deficiencies. There are a number of locations where remedial works are required to mitigate against flooding. In many cases the stormwater system is under capacity and works are required to increase the capacity and reduce the flooding potential.

Flood mitigation strategies were based on augmentation of the existing infrastructure. Strategies were developed to provide flood protection to residential properties and other infrastructure as well as to maintain access during major flow events.

Both upstream and downstream of the identified drainage deficiency locations were examined to either reduce the flow entering the location where the failure occurred or increase the capacity of the downstream infrastructure. Flow reduction at the location could occur by the installation of detention devices to reduce peak flow or construction of an additional pit upstream if pipe capacity was not limiting. Downstream capacity could be increased by duplication or reshaping a channel. Where these methods were unsuccessful in creating a cost effective system to provide flood protection, diversion of the stormwater using an alternate route was investigated.

The options developed are shown in Figure 6, Figure 7 and Figure 8.

Each component is discussed in the text that follows.

With regard to urban infill issues, the existing DTEI rail corridor is the most likely location for future development of the northern side of Truro. The remainder of the township is close to fully developed and consequently these areas are unlikely to change significantly in the foreseeable future.

If the railway corridor area were to be subdivided it would require elements to retain peak flow at pre development levels otherwise the already stretched drainage system would be further compromised. It is envisaged that this could be successfully achieved by integrating the installation of detention basins with the proposed wider flood mitigation strategies outlined below.

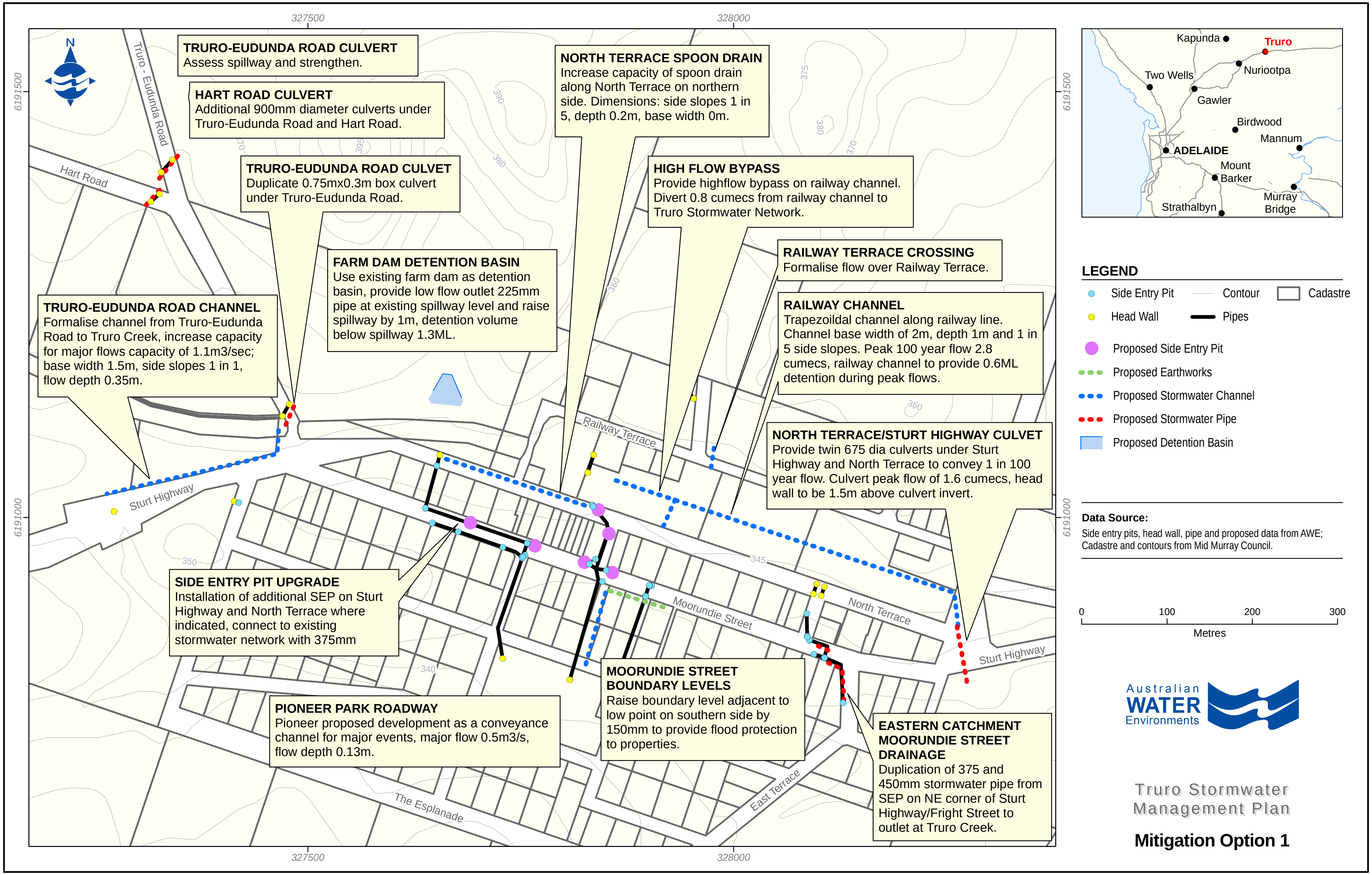

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Figure 6

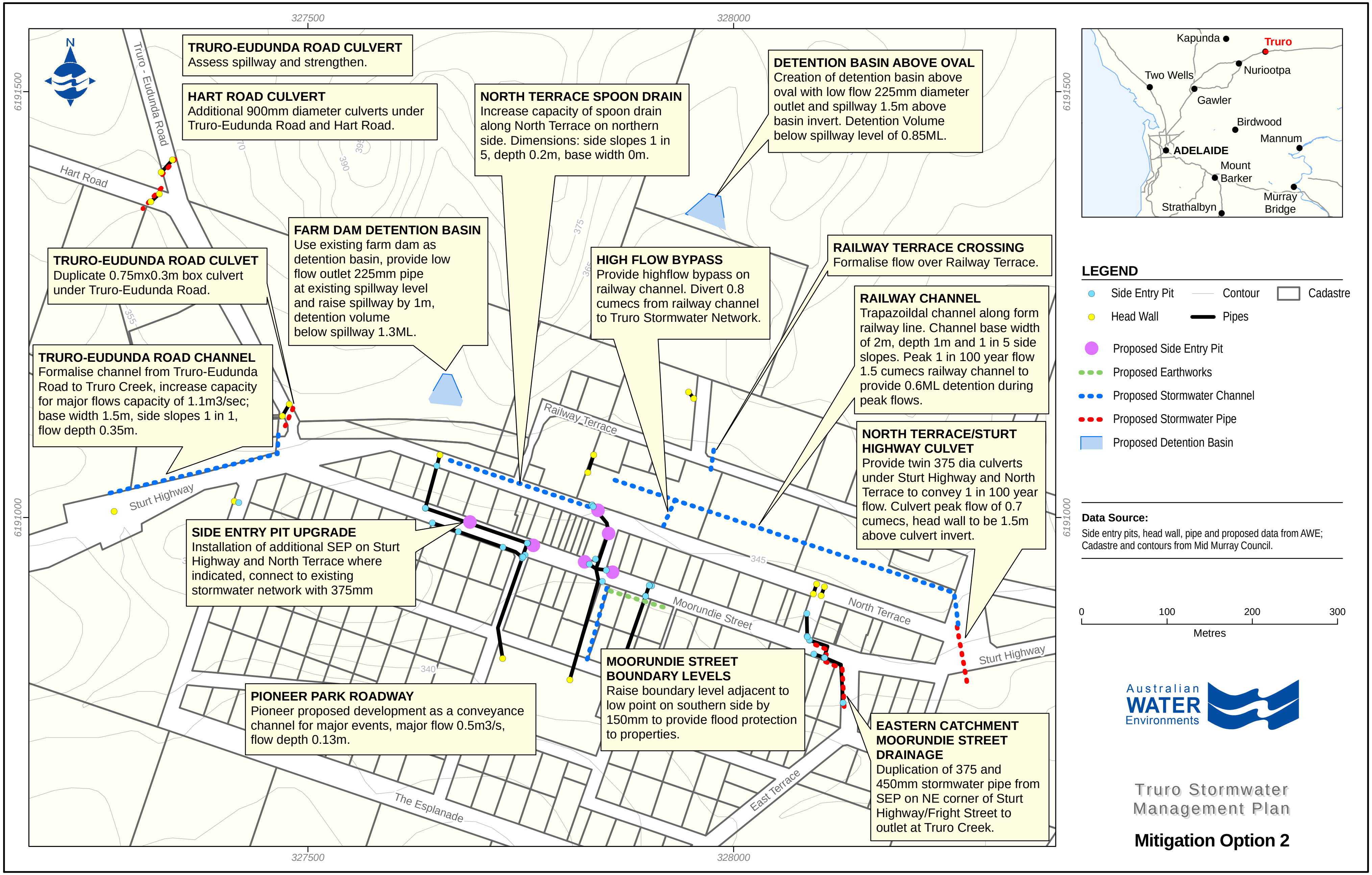

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Figure 7

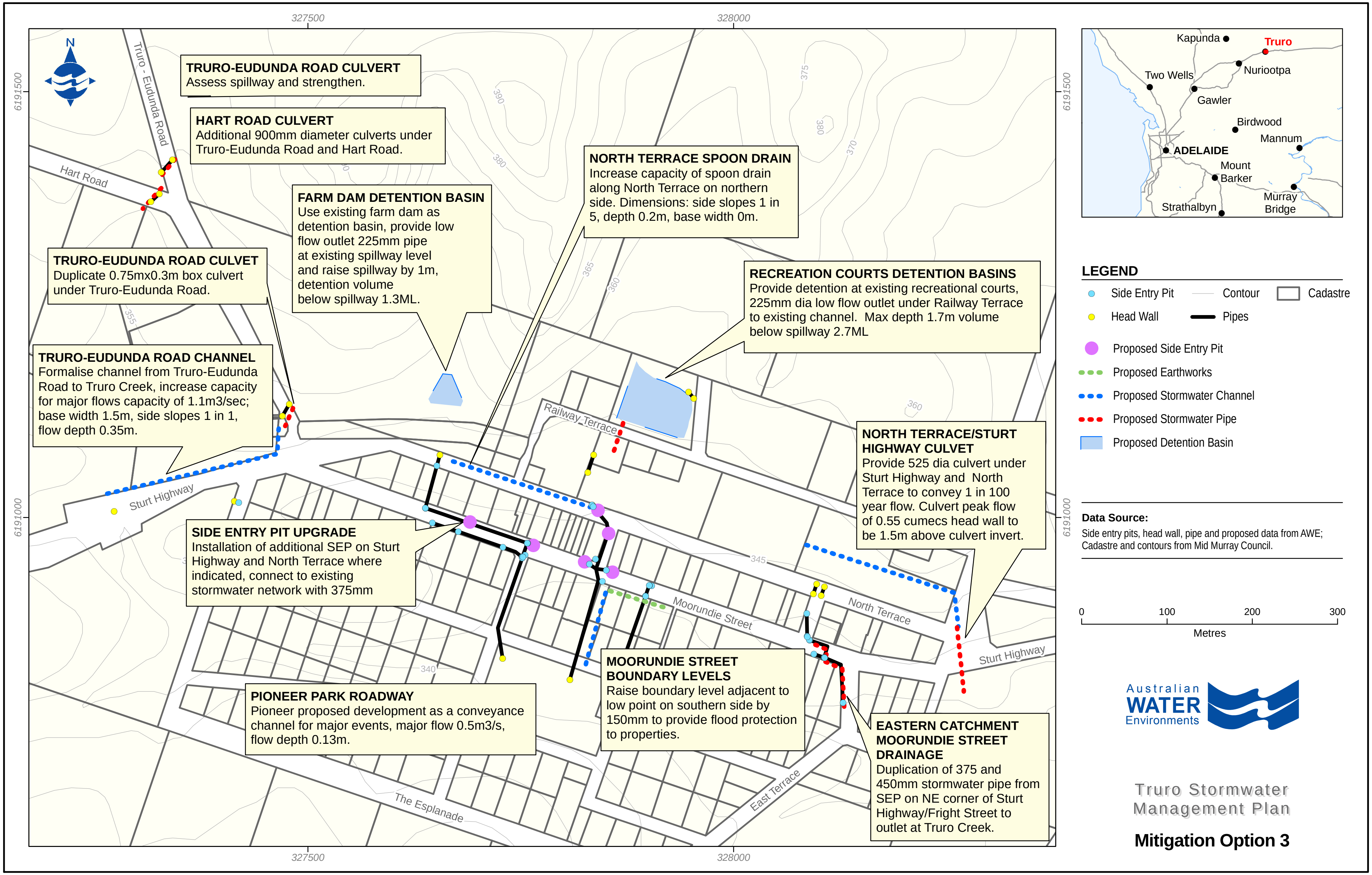

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Figure 8

a) *Truro Oval Catchment Mitigation*

The catchment contributing runoff to Railway Terrace includes the Oval and agricultural land north of Truro township. Runoff from this catchment flows towards the township. There are no dedicated overland flow routes through the township. Consequently, the management of stormwater from this catchment is critical for flood management. Presently, stormwater from this catchment is conveyed from North Terrace via an SEP where the existing pipe is under capacity, Overflow is conveyed along Passenger Street. Passenger Street is also under capacity for events greater than a 1 in 5 ARI event. The peak flows for a major event are significantly greater than the current capacity of this section of the Truro stormwater drainage network. Increasing the capacity of the underground network would require significant works. Consequently, three options utilising detention basins and diversion channels around Truro were investigated.

Option 1: Stormwater Bypass

A channel is proposed to direct a portion of high flow around the township. The channel would be located within the DTEI corridor and cross the Sturt Highway via a large culvert to the east of the township. Low flows would continue to enter the existing stormwater network above Passenger Street. This will assist in reducing the required capacity of the proposed channel within the railway reserve.

The former railway line within the DTEI corridor was levelled for the tracks and provides the best location for the channel as fewer earthworks are required for this location than adjacent to either Railway Terrace or North Terrace where there are significant undulations.

The low flow bypass would be located north of Passenger Street, this would divert low flows through the existing stormwater network. A maximum flow of 0.8 cumecs would flow through to the existing North Terrace/Passenger Street drain. The stormwater network at this location with the other required works has the capacity to accept this flow without causing flooding. The channel required would have 1 in 5 side slopes a base width of 2m and a depth of 1m the peak flow in the channel for a 1 in 100 ARI event is 2.8m^3/s.

Preliminary sizing has also been undertaken for a trapezoidal channel to convey stormwater approximately 400m to Truro-Dutton Road. The channel would run on the western side of the Truro Dutton Road. Twin 675mm culverts are proposed to convey the stormwater under the Sturt Highway, scour protection would be required on the channel conveying flow to the Truro Creek. The channel would also provide detention to reduce the peak flow through the culverts under the Sturt Highway, thereby reducing their required capacity.

The former railway corridor may have some soil contamination remaining from the railway line resulting from either chemicals used to maintain the line or hydrocarbons. An assessment would need to be carried out to assess any contamination issues identified. This assessment has been excluded from the costing of the stormwater mitigation option.

Cost Estimate: $160,000.

Option 2: Stormwater Bypass with Detention

As with Option 1, this utilises a trapezoidal channel along the railway corridor. However, a detention basin in the catchment above the oval is also proposed. This basin would reduce the peak flow downstream of the oval catchment with a peak 1 in 100 year flow of 2.2m^3 per second. This allows smaller twin 375mm culverts under the Sturt Highway and North Terrace.

The proposed basin would have a low flow 225mm outlet at the basin invert and spillway 1.5m above the basin invert. The capacity below the spillway invert level would be approximately 0.9ML.

Cost Estimate: $160,000.

Option 3: Recreation Court Detention Basin

A detention basin at the existing recreation court location is proposed which would be large enough to reduce the peak flow from the oval catchment with the low flow outlet connected to the existing Truro stormwater network.

The detention basin would require a capacity of 2.7ML and an elevation of 1.7m to the spillway above the basin invert on the existing slope with a width and height of 60m and 50m respectively. A low flow 225mm diameter pipe from the detention basin would act to throttle flows. Discharge from the basin would be to the existing channel that traverses the railway easement.

A channel through the railway easement would be required for the catchment east of the oval. Stormwater would be conveyed under the Sturt Highway via a

525mm diameter culvert. The peak flow from the eastern catchment is estimated to be 0.93m^3/s.

Cost Estimate: $130,000.

b) Truro-Eudunda Road/Hart Road Culvert

Culverts under Truro-Eudunda Road (525mm) and Hart Road (600mm) from the rural catchment are under capacity for low frequency rainfall events. Overflow from the culvert discharges along the verge of Truro-Eudunda Road towards the Truro township. It is believed this exacerbates flooding within Moorundie Street. Installation of a 900mm diameter culvert under Truro-Eudunda Road and Hart Road would allow additional stormwater to be directed to Truro Creek upstream of the township.

Cost estimate: $40,000

c) Truro-Eudunda Road/North Terrace Culvert

The culvert under Truro-Eudunda Road will be under capacity for low frequency events (assuming works on Hart Road culvert are undertaken). Overflow from the culvert is currently conveyed along the verge of Truro-Eudunda Road to the Truro township. This is believed to exacerbate flooding within Moorundie Street. The preferred solution is install a duplicate 0.75mx0.3m box culvert under the Truro-Eudunda Road.

Costs Estimate: $15,000.

d) Truro-Eudunda Road Channel

The existing channel from Eudunda Road to Truro Creek is under capacity. Overflow from this channel discharges to Sturt Highway and to West Terrace, exacerbating flooding in this area. The proposal is to increase capacity for major flows to 1.1m^3/s (requiring a channel with base width 1.5m, side slopes 1 in 1, and a flow depth of 0.35m). Relocation of services will be required and the channel sides are due to the constricted nature of the flow path.

Cost Estimate: $50,000.

e) Farm Dam Detention Basin

Stormwater from north of North Terrace contributes to flooding on North Terrace and Moorundie Street. It is proposed to provide detention by increasing the storage capacity of the existing farm dam. This would involve increasing the spillway elevation by 1m and having a 225mm diameter low flow outlet. The discharge rate from the basin for short duration events could be significantly decreased. This would provide approximately 1.3ML of detention storage. Modification with the dam would need to be conducted with consultation and permission of the land holder.

Cost Estimate: $25,000.

f) North Terrace Spoon Drain

North Terrace is currently is under capacity for events of 1in 5 ARI and above. Stormwater flows exceed the channel capacity and discharge through residential property. The proposed works would be to reshape the spoon drain on the northern side of North Terrace to increase its capacity.

Cost Estimate $30,000

g) Side Entry Pit Upgrade

The side entry pits on Moorundie Street are under capacity relative to the capacity of the pipe system. Additional pits connecting to the Trunk drainage through Truro will allow increased stormwater flows through the existing stormwater network. Six (6) locations have been identified for additional side entry pits on Moorundie Street and North Terrace.

Cost Estimate: $30,000

h) Pioneer Park Roadway

The development of Pioneer Park provides an additional overland flow path from Moorundie Street to Truro Creek during major flow events. This has been estimated to be $0.5m^3/s$.

i) Moorundie Street Boundary Levels

Existing property boundary levels on Moorundie Street at the sag are below the level of the overland flow path through Pioneer Park. An option would be to raise the boundary levels adjacent to the sag by approximately 100mm to prevent flow through residential properties.

Cost Estimate: $25,000.

j) Moorundie Street Eastern Catchment

The drainage network at the sag at the western end of Moorundie Street is currently under capacity for major events, with flows overtopping the kerb and inundating property. The duplication of a section of this network allows for increased capacity.

Cost Estimate: $35,000.

k) Truro-Eudunda Road Dam

The spillway of the Truro-Eudunda Road Culvert is currently an informal earthen wall. Augmentation of the existing wall may be required to prevent failure of the farm dam wall.

Cost Estimate: $5,000.

7 Water Quality, Harvesting and Reuse

7.1 Introduction

Stormwater harvesting and reuse has the benefits of using a resource that has previously been consider a problem and minimising demand from external sources. Recycling can be achieved by utilising a number of methods, including aquifer storage and recovery, diversion of local runoff for irrigation of street trees and rainwater tanks connected to roof areas for both domestic and for community schemes for reuse in garden watering/irrigation, toilet and laundry.

The real cost of water is being realised as increased demand increases the pressure on existing supplies. With constraints on the availability of existing water supplies including:

- Increased cost of existing supplies making stormwater harvesting financially more attractive; and
- Increased awareness of the impacts that urban runoff is having on receiving waters.

Whilst these and other issues indicate that harvesting urban runoff is desirable there are a number of factors that can limit the practical harvesting of urban runoff. These primarily include:

- Runoff from urban areas is often polluted and requires treatment;
- Runoff occurs over short periods of time during storms and predominantly in the winter/spring period. It is highly seasonal and temporally variable. This means that water needs to be stored because the main demand time is usually in summer when runoff rates are lowest and storms are less frequent and of shorter duration; and
- There needs to be sufficient space to be able to treat and store the harvested water.

Harvesting and reuse of water can be done on a range of scales from the household level through to large residential or industrial developments, or community scale.

On the smaller scale, onsite retention systems such as rainwater tanks and infiltration trenches (which act to recharge the groundwater) are simple, well proven techniques. These systems can be implemented with development and uptake encouraged through the planning Systems such as these can also be retrofitted.

Larger scale systems may require significant infrastructure and the ability to catch and store water from a large area compared to that of an individual property or allotment can be complicated by a number of issues.

Preliminary investigations undertaken in 8.2 show that MAR is not suitable given the nature of the fractured rock aquifer beneath Truro which has low extraction and recharge rates and low storage volumes. Additionally there are no suitable temporary storage locations. The unsuitability of a MAR scheme and lack of a suitable surface storage location precludes the use of a combined stormwater wastewater reuse scheme. A wastewater only scheme could be feasible with the development of a STEDS program for Truro if a suitable waste water storage location could be found. However a wastewater only reuse program has not been investigated as part of the Truro Stormwater Management Plan.

Stormwater quality can also affect the receiving waters with the high nutrient loads that can be contained in urban stormwater runoff as well as other pollutants such as hydrocarbons.

Truro waste water treatment is predominantly via a septic system, with overflow from septic systems providing additional water quality issues.

Water quality treatment devices are aimed at providing treatment to high frequency runoff events. The design capacities are typically in the order of a 1 in 3month event.

7.2 Existing stormwater harvesting and treatment systems

There are currently no specific stormwater harvesting or treatment infrastructure within the township. Furthermore the only storm water quality improvement system is the ponded area of Truro Creek near Pioneer Park. This area provides semipermanent detention of water and slows water flow to allow particles to settle. The location of the pond on the main channel limits the benefit provided to the urban runoff as it is diluted with runoff from the rural catchment. Furthermore, large flows with high velocities from the rural catchment area are likely to resuspend particles as there is no high flow bypass.

Stormwater conveyance in many areas in the township is via spoon/table drains on the road verges. These drains have little vegetation within them and are unlikely to provide any water quality treatment. A grass swale is located adjacent to the Truro Oval. However the benefit to water quality discharged to Truro Creek is expected to be minimal due to the location high in the catchment.

Currently a high proportion of residential properties have rainwater tanks. This reduces the quantity of stormwater from residential properties to the street.

It is understood that the development of Pioneer Park will include water sensitive urban design features including rainwater tanks and water sensitive plantings which highlights Council’s desire to implement effective best practise methods.

8 Water Quality, Harvesting and Reuse Strategies

8.1 Introduction

Water sensitive options were investigated for Truro township. The options developed had to consider the existing infrastructure and required flood mitigation infrastructure. All water reuse options were explored including the potential for collecting and storing stormwater using a Managed Aquifer Recharge program.

Development of a treatment train required consideration for both supply and demand for the stormwater as well as suitable locations for the devices.

Stormwater reuse and water quality treatment options were developed to maximise reuse and water quality treatment while maintaining adequate flood protection for the township. As there are considerable existing drainage deficiencies, this limits potential options as many WSUD devices slow velocity and consequently may increase the potential flood risk. The developed options focused on devices that had minimal or beneficial impact on flooding.

Development of the stormwater treatment train and analysis of its effectiveness was undertaken with a MUSIC water quality model. Preliminary sizing of the structures was carried out in MUSIC with the constraints of the existing network considered.

The parameters selected for the MUSIC model were for standard rural residential properties taken from MUSIC model guideline values for pollution generation loads. Other properties such as infiltration rates were taken from literature. Thirty minute rainfall data from 1985-2009 was used to assess the stormwater network performance, (recorded at Mingays Water Hole located approximately 15km WNW from Truro).

Assessment of water quality was based on the Environmental Protection Policy: Water Quality concentrations values for:

- Total Suspended Solids (TSS) 20 mg/L
- Total Phosphorous (TP) 0.5 mg/L

- Total Nitrogen (TN) 5 mg/L.

8.2 Managed Aquifer Recharge

Managed Aquifer Recharge (MAR) schemes utilise the aquifers as a temporary storage for treated stormwater and/or wastewater. The quality of stormwater/wastewater is required to meet guideline values before being injected into an aquifer.

Truro is located on the eastern fringe of the Adelaide geosyncline with the geology dominated by Lower Cambrian Heathdale Shales which form the main fractured rock aquifer beneath Truro.

A review of the data that is available on the Drillhole Enquiry System indicates that bore yields are generally below 1 L/s. Groundwater salinity ranges between 1,400 to 4,800 mg/L. It is unknown how much groundwater is utilised in the Truro area.

A review of the available data suggests that potential for Managed Aquifer Recharge (MAR) is limited in the Truro area. While groundwater salinities are reasonable, low bore yield indicate that injection efficiencies would be low which in turn limits the volume of water that can be injected.

MAR in fractured rock presents several operational and management challenges. The structural nature of fractured rock implies that there is generally less void volume available for storage compared to porous media aquifers over the same area and can lead to transport of the injected water over large distance. If the fractured rock aquifer is unconfined the potential for leakage to the surface is increased. The aperture size and spacing of the fractures is also a critical element in determining in-flow volumes and pressure, the fractures are also highly susceptible to clogging via filtration of suspended solids and growth of microbial communities.

National and international experience has also found that fractured rock aquifers are generally the most difficult aquifers to manage with respect to well clogging and recovery of injected water (AGWR: MAR, 2004).

It has therefore been concluded that implementation of an MAR scheme is highly unlikely to be successful and hence is not recommended.

8.3 Water Quality and Reuse

8.3.1 Introduction

Options for water quality improvement and reuse are limited because of existing infrastructure constraints, limited space available, requirements for flood protection, and the lack of a suitable aquifer to support MAR.

The focus of most of the stormwater treatment devices is on the Moorundie Street drainage network as this area has the greatest traffic being a National Highway. Consequently, the stormwater from Moorundie Street is likely to have the lowest quality and would receive the greatest benefit from stormwater quality treatment devices. The developed options are shown in Figure 9.

Grass swales can be an effective treatment system but they require vegetation to be maintained throughout summer periods. The maintenance eof grassed swales over the summer period was considered problematic with significant vegetation die back expected creating potential water quality and erosion problems.

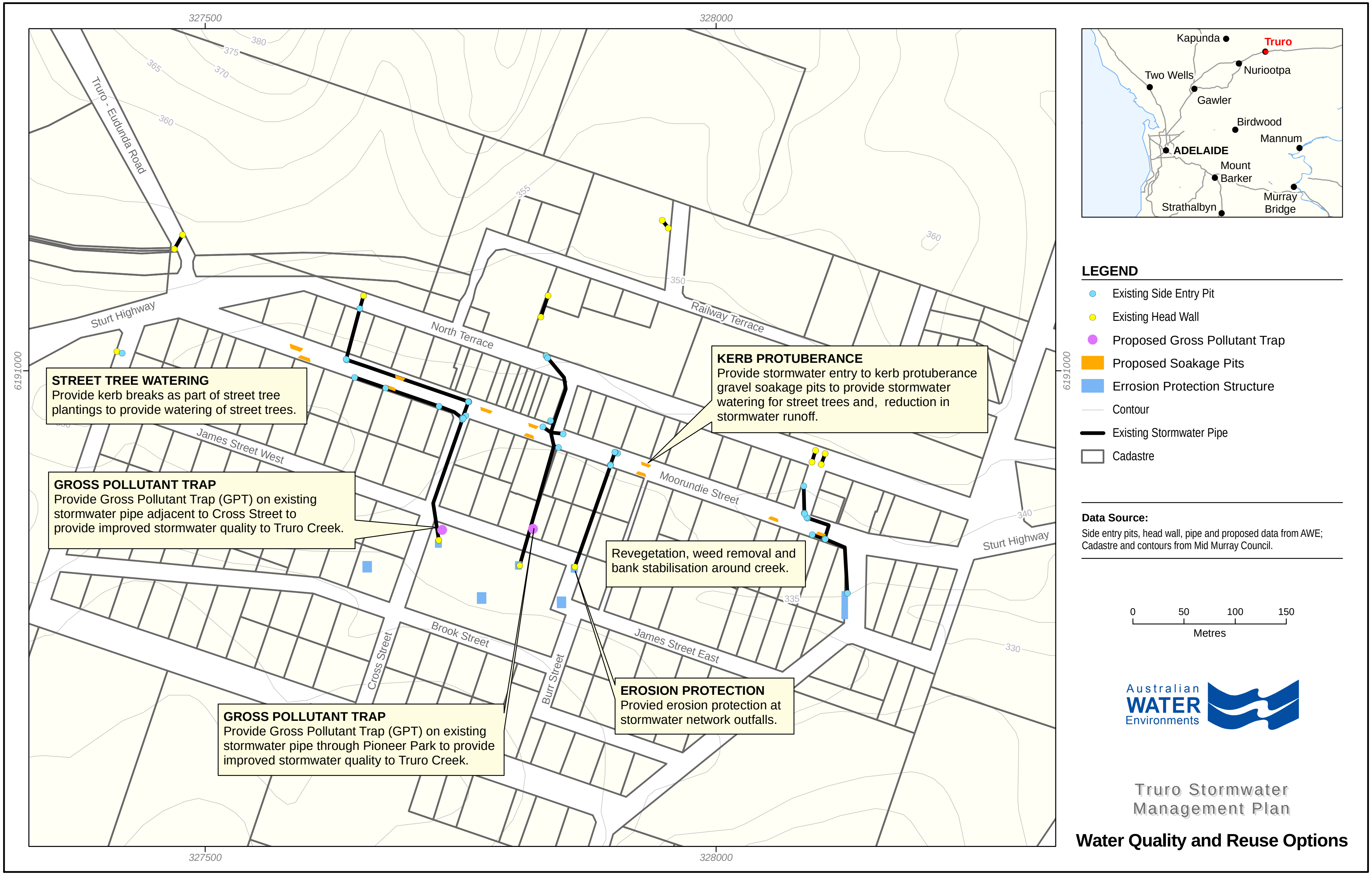
The proposed water quality and reuse strategies are summarised in Figure 9 and outlined in the sections that follow.

8.3.2 Water quality and reuse strategies

a) Moorundie Street Kerb Protrusion Soakage Pits

Installation of soakage pits at existing kerb protuberances locations on Moorundie Street were considered. The protuberances have the potential to be converted to vegetated soakage pits. These soakage pits would act provide water quality benefits as the stormwater infiltrates through the soakage pit and provides water for surrounding vegetation and reduces surface runoff to Truro Creek for minor storm events.

There are 15 of the protuberances on Muroondie Street with four already having some vegetation. The remaining 11 have been paved. Ten of the protuberances are suitable to be converted to soakage trenches/biofiltration deviceswith the remaining located either on a high point or directly downstream of a side entry pit.


327500
328000
6191000
Truro - Eudunda Road
Sturt Highway
North Terrace
Railway Terrace
James Street West
Moorundie Street
James Street East
Brook Street
Cross Street
Burr Street
STREET TREE WATERING
Provide kerb breaks as part of street tree plantings to provide watering of street trees.
GROSS POLLUTANT TRAP
Provide Gross Pollutant Trap (GPT) on existing stormwater pipe adjacent to Cross Street to provide improved stormwater quality to Truro Creek.
GROSS POLLUTANT TRAP
Provide Gross Pollutant Trap (GPT) on existing stormwater pipe through Pioneer Park to provide improved stormwater quality to Truro Creek.
KERB PROTUBERANCE
Provide stormwater entry to kerb protuberance gravel soakage pits to provide stormwater watering for street trees and, reduction in stormwater runoff.
Revegetation, weed removal and bank stabilisation around creek.
EROSION PROTECTION
Provied erosion protection at stormwater network outfalls.
Kapunda
Truro
Two Wells
Nuriootpa
Gawler
Birdwood
Mannum
ADELAIDE
Mount Barker
Murray Bridge
Strathalbyn
LEGEND
Existing Side Entry Pit
Existing Head Wall
Proposed Gross Pollutant Trap
Proposed Soakage Pits
Erosion Protection Structure
Contour
Existing Stormwater Pipe
Cadastre
Data Source:
Side entry pits, head wall, pipe and proposed data from AWE; Cadastre and contours from Mid Murray Council.
0 50 100 150
Metres
Australian WATER Environments
Truro Stormwater Management Plan
Water Quality and Reuse Options

The concept of the soakage pit is to have local gutter flow, which currently flows past the protuberance, to be diverted into a soakage pit that is constructed within the protuberance. This would be achieved by excavating the area within the protuberance to a depth between 1-1.5m, fill with a permeable soil and selected plantings and divert stormwater into the soakage pit. This provides an area of approximately $20m^2$, depending on location, for water quality treatment. There potentially will be a significant step between the road and roadside edge of the protuberance because of the camber of the road; careful design is required for pedestrian safety around this step. Services located under the pit would need to be protected or relocated where required.

The protuberances can contain native grasses, sedges or small shrubs. Once established, little watering would be required because they would be watered naturally from the large impermeable catchment area contributing to each pit. Even light rains could be expected to provide significant flows to water the vegetation.

The soakage pits would provide a reduction of stormwater discharging to Truro Creek. Water treatment will occur as water percolates through the soakage pit and reuse of water via direct irrigation of the vegetation trees.

There is significant potential to reduce stormwater runoff during low flow events. Infiltration would occur over and area of approximately $20m^2$. A porous medium (sandy soil) would be able to treat approximately 1L per second.

b) Kerb Break Street Tree Watering

Kerb breaks created with new plantings provide a source of water for street trees and divert stormwater away from the underground network. Kerb breaks would allow some stormwater to be diverted from the kerb and channel to irrigate the street trees. Kerb breaks cannot be added to existing street trees because they need to be sunken so that the ground surface behind the kerb is lower than kerb level to allow for flow to enter. This creates a step and potential tripping hazard which must be managed. The area can be either covered by a grate or a barrier around the area with the possibility of using the barrier to also provide seating around the tree.

Kerb breaks provide infiltration for stormwater with a surface area limited to the space surrounding the tree, there is a potential for infiltration of up to approximately 0.1L per second for each kerb break.

c) Gross Pollutant Trap

The installation of two proprietary gross pollutant traps are proposed. One for the stormwater pipe running through the drainage easement on land adjacent to Pioneer Park, and the other near the outlet of the stormwater pipe adjacent to Cross Street. These devices would provide water quality improvement to the discharge to Truro Creek. Gross pollutant traps can be retrofitted to existing underground stormwater networks. Gross pollutant traps are able to remove nutrients as well as hydrocarbons. Gross pollutant traps need regular maintenance to remove collected pollutants as some pollutants can be resuspended during further storm events if not removed.

d) Scour Protection

The condition of all outfalls is considered to be poor with erosion occurring at all outfall locations.

Scour and erosion protection is proposed at the downstream end of all stormwater pipe outlets. Generally, these will comprise loose rock riprap that is keyed into to the natural surface. Point source outfalls with high velocities can erode areas around the pipe. Providing stormwater scour protection in the form of large rock prevents erosion around the outfall and reduces the risk of polluting receiving waters.

e) Additional Water Quality Treatment

The ponded area of Truro Creek could be expanded to provide additional water treatment. This could be achieved by taking this area off line, by means of constructing a high flow bypass from the existing creek line. The impact on flooding of the Truro Creek would be an important design constraint.

Such a project would involve considerable realignment works and hence should be the subject of a specific scoping study and hydraulic design should council consider the concept has merit.

Permeable paving could be installed on car parks to provide treatment/storage and flow reduction from these areas. However, each site would need to be redesigned and reconfigured so as to accommodate the requirement pervious paving systems. Frequent use by heavy vehicles can compromise these pavement systems and hence this is likely to only be suitable for car parking areas.

Bioretention basins could be implemented with new developments to reduce peak flows and provide stormwater treatment, but given the limited growth opportunities in the foreseeable future this is unlikely toe provide significant benefits in the short to medium term.

8.4 Water Quality Modelling Results

The MUSIC model examined the affect of implementing the stormwater treatment devices on the water quality from the site. Soakage pits and GPTs were modelled with 30 minute historical rainfall data.

The stormwater reuse from the treatment train developed is approximately 30% of the total stormwater runoff from northern Truro Catchment. This is a significant volume which is reused for irrigation of street trees.

There is an associated reduction in the total load of pollutants entering Truro Creek. The guideline values from the Environmental Protection Policy Water Quality values for discharge to a fresh water environment are met for the mean discharge, (see Table 1).

Table 1: MUSIC Modelling Results

	Mean (mg/L)	90%ile (mg/L)	Generated (kg/a)	Discharged (kg/a)	Reduction (%)
TSS	18.2	55.3	2960	632	78.6
TP	0.144	0.305	4.04	2.24	44.7
TN	1.33	2.35	31	16.8	45.7

9 Catchment Work Priorities

Truro has had a history of flooding resulting in flood damage to streets and private properties. As a result flood management is considered as being of highest priority by the community and council. The assessment of the drainage system using DRAINS supports the community's view that there are significant drainage deficiencies. The main ones being:

- Truro-Eudunda Road Hart Road Culvert;
- Truro-Eudunda Road, North Terrace, Culvert;
- Channel from Truro-Eudunda Road to Truro Creek;
- North Terrace;
- North Terrace/Passenger Street;
- Moorundie Street/Sturt Highway Drainage; and
- Freight Street.

Strategies have been developed for each of the identified deficiencies. The Truro Oval catchment has been identified as a source of significant runoff contributing to flooding. Three options were developed for providing flood mitigation for Truro with the preferred solution being:

- Providing a drainage channel along the rail corridor and through a culvert under the Sturt Highway on the eastern edge of Truro to Truro Creek;

An assessment of water quality treatment and reuse opportunities indicated that large scale reuse schemes utilising Managed Aquifer Recharged (MAR) were unlikely to be viable given the nature of the aquifer under Truro as well as a suitable location for temporary storage and pre-treatment.

Water reuse and treatment options were therefore developed principally on Moorundie Street with small scale reuse devices in the form of soakage trenches and kerb breaks to provide street tree watering.

A summary table of works, cost and benefits follows.

Priority	Project/Activity Title	Capital Cost ($)	Recurrent Cost ($/Annum)	Flood Mitigation Benefit		Water Harvesting Benefit		Water Quality Benefit		Other Benefits	
				Measure Used	Quantification or Description of Benefit	Measure Used	Quantification or Description of Benefit	Rating		Rating	
				(A) – ADD Reduction (P) – Properties Affected (Q) – Qualitative		(V) – Volumetric (Q) – Qualitative		(H) – High (M) – Medium (L) – Low	Qualitative Description of Benefit	(H) – High (M) – Medium (L) – Low	Qualitative Description of Benefit
1	Pioneer Park Roadway	NA	NA	P	7 Properties located on Moorundie Street						
2	Truro Oval Catchment Mitigation										
	a) Stormwater Bypass	$159,500	$1000	P	10 - Located on Railway Terrace, and Moorundie Street, in conjunction with stormwater measures 1,4-5, & 7-9. Protects Sturt Highway from flooding.						
	b) Stormwater Bypass with Detention	$158,600	$1000	P	10 - Located on Railway Terrace, and Moorundie Street, in conjunction with stormwater measures 1,4-5, & 7-9. Protects Sturt Highway from flooding.			L	Water quality treatment within detention basin, high input water quality		
	c) Recreation Court Detention	$131,400	$1000	P	10 - Located on Railway Terrace, and Moorundie Street, in conjunction with stormwater measures 1,4-5, & 7-9. Protects Sturt Highway from flooding.						
3	Moorundie Street Eastern Catchment	$34,000		P	2 - Properties on Moorundie Street						
4	Truro-Eudunda Road/Hart Road Culverts	$36,600		P	7 - Moorundie Street, in conjunction with stormwater measures 1-2, 5, & 7-9. Protects Sturt Highway from flooding.						
5	Truro-Eudunda Road/North Terrace Culvert	$14,300		P	13 - Moorundie Street, in conjunction with stormwater measures 1,2 ,4, &7-9. Protects Sturt Highway from flooding.						
6	Truro-Eudunda Road Channel	$44,800		P	3 – Properties adjacent to West Terrace						
7	Farm Dam Detention Basin	$25,600		P	13 – North Terrace and Morrundie Street in conjunction with stormwater measures 1-2,4-5 &7-10. Protects Sturt Highway from flooding.			L	Water quality treatment within detention basin, high input water quality		
8	Side Entry Pit Upgrade	$30,200	$100	P	7 - Moorundie Street, in conjunction with stormwater measures 1-2, 5,7 & 9						
9	Moorundie Street Boundary Levels	$22,800	-	P	3- Southern side of Moorundie Street adjacent to low point						
10	North Terrace Spoon Drain	$27,000	-	P	7 - Southern side of North Terracein conjunction with 7					L	Spoon drain replaces dirt lined channel where erosion occurs
11	Moorundie Street Kerb Protrusion Soakage Pits	*$200,000*	$10,000			V	0.2ML per year per device	H	Greater than 80% removal of pollutants due to reduction in flows		
12	Kerb Break Street Tree Watering	$30,000	$1,000			V	Up to 20KL per year per protuberance	M	Reduction in pollutants due to reduction in flows		
13	Gross Pollutant Traps	$150,000	$10,000					H	Greater than 70% removal of TSS and 30% removal of TP and TN loads entering GPT		
14	Scour Protection	$15,000						M	Reduction in sediment from scour entering watercourse	H	Erosion protection of Truro Creek Banks

Appendix A: DRAINS Model Details

DRAINS Model Development

Pit/Pipe information generated from GIS database of Truro Stormwater Network including Lengths, sizes, invert levels and pit details. Truro Stormwater Network:

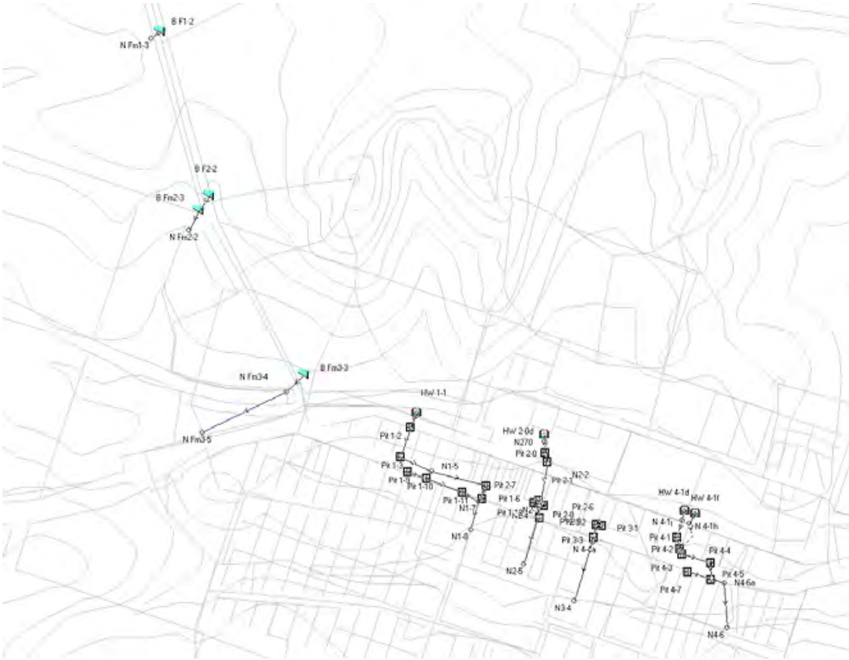


Figure 1: Existing Truro Stormwater Network

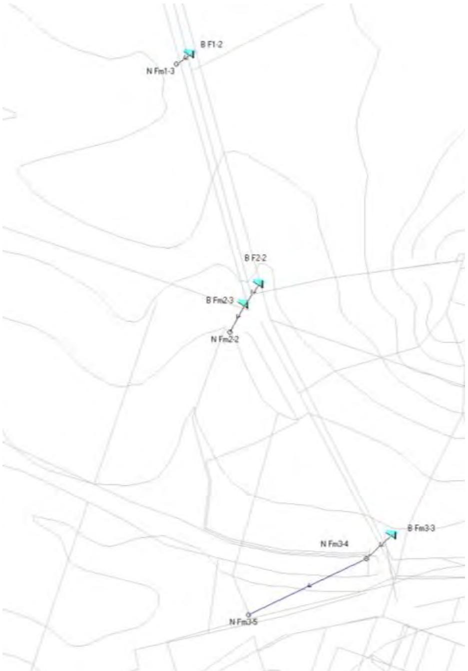


Figure 2: Truro-Eudunda Road Stormwater Network

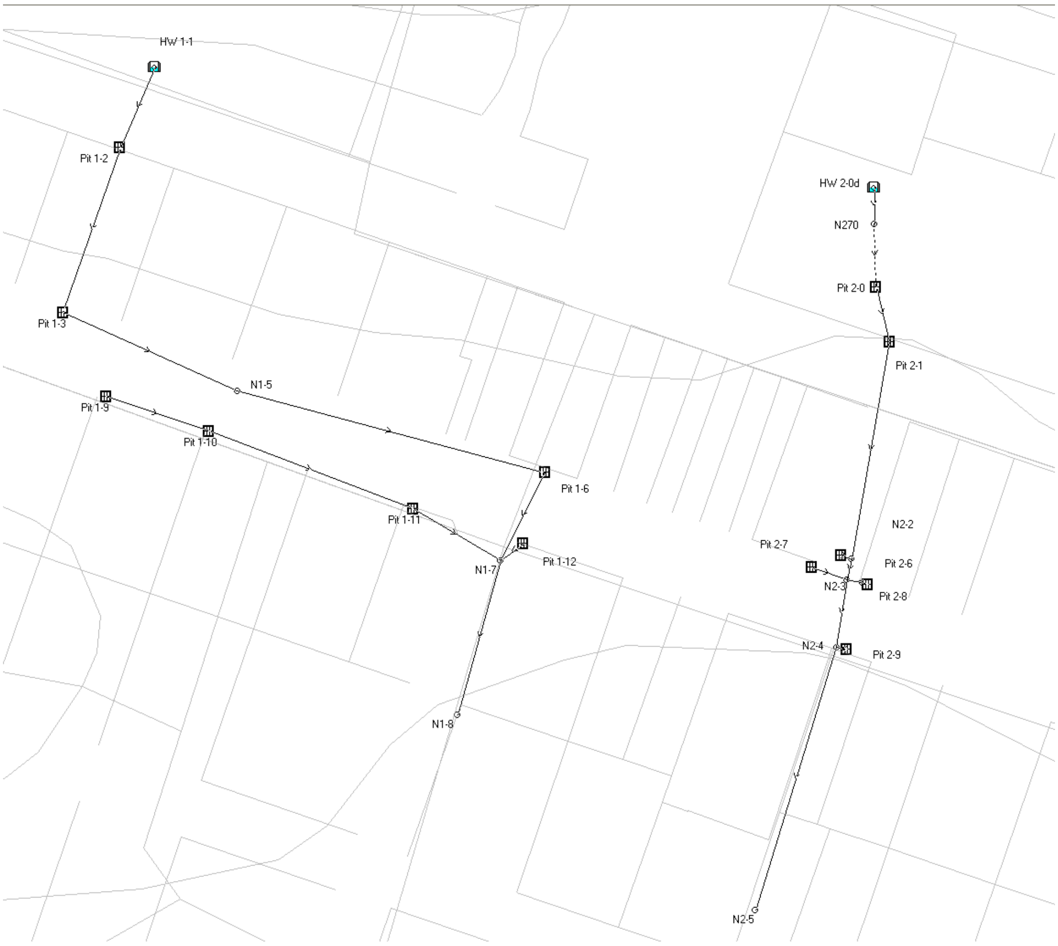


Figure 3: Truro Stormwater Network 1 and 2

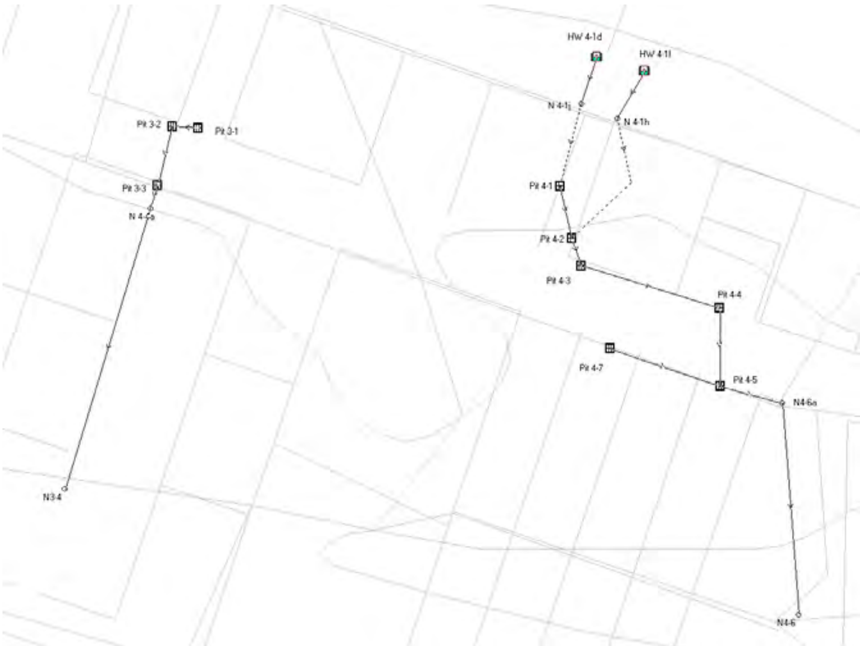


Figure 4: Truro Stormwater Network 3 and 4

Table 1: Pit/ Headwall details

Name	Type	Pit inlet Details H(m)xW(m)xgrade(%)	Ponding Volume (cu.m)	Surface Elev (m)	Max Pond Depth (m)
HW 1-1	Headwall			346.508	
HW 2-0d	Headwall			346.5	
HW 4-1d	Headwall			342.664	
HW 4-1f	Headwall			342.61	
Pit 1-2	OnGrade	0.1x0.9-1.5%		346.118	
Pit 1-3	OnGrade	0.1x0.9-1.5%		341.919	
Pit 1-6	OnGrade	0.15x0.9 0.75%		340.563	
Pit 1-10	OnGrade	0.2x1.9 1%		341.213	
Pit 1-12	OnGrade	0.12x0.9 1%		340.463	
Pit 1-11	OnGrade	0.17x1.9 0.5%		340.619	
Pit 1-9	OnGrade	0.15x1.9 1%		341.632	
Pit 2-7	OnGrade	0.15x0.9 1%		340.074	
Pit 2-8	OnGrade	0.12x0.9 1.5		339.989	
Pit 2-6	OnGrade	0.2x0.9 3.5%		340.382	
Pit 4-1	OnGrade	0.99x0.9 Grate 9%		340.074	
Pit 4-2	OnGrade	0.15x2.0 5%		337.806	
Pit 4-3	OnGrade	0.13x1.0 2%		337.62	
Pit 4-7	OnGrade	0.95x2.0 2%		337.35	
Pit 2-0	OnGrade	0.375x3 4%		343.87	
Pit 2-9	Sag	0.16x1.9 SAG	5	339.674	0.072
Pit 3-1	Sag	0.12x0.9 SAG	7	339.792	0.2
Pit 3-2	Sag	0.7x0.9 Grate SG	7	339.782	0.2
Pit 3-3	Sag	0.12x0.9 SAG	5	339.508	0.166
Pit 4-4	Sag	0.13x0.9 1%	42.2	337.485	0.42
Pit 4-5	Sag	0.95x0.1-sag	50	337.31	0.3
Pit 2-1	Sag	0.375x3.0 4%	10	342.97	0.3

Table 2: Pipe Details

From	To	Length	U/S IL	D/S IL	Slope	Diameter
		(m)	(m)	(m)	(%)	(mm)
B F2-2	B Fm2-3	40	362.006	361.595	1.03	525
B Fm2-3	N Fm2-2	40	360.687	360.115	1.43	600
B Fm3-3	N Fm3-4	20	350.61	350.45	0.8	0.75W x 0.3H
HW 1-1	Pit 1-2	13	345.348	345	2.68	375
Pit 1-2	Pit 1-3	52	345	341.053	7.59	450
Pit 1-3	Pit 1-6	131	341.029	339.65	1.05	525
Pit 1-6	N1-7	17	339.518	339.2	1.87	600
N1-7	N1-8	129	339.2	336.71	1.93	900
Pit 1-10	1-11	7	340.299	339.711	1.07	525
Pit 1-12	N1-7	3.5	340.025	339.2	23.57	375
Pit 1-11	N1-7	25	339.711	339.2	2.04	525
Pit 1-9	Pit 1-10	32	340.697	340.299	1.24	525
Pit 2-9	N2-4	12	338.784	338.6	1.53	375
N2-4	N2-5	110	338.6	336.74	1.69	900
Pit 2-7	N2-3	10	339.157	339	1.57	375
N2-3	N2-4	12	339	338.6	3.33	750
Pit 2-8	N2-3	10	339.216	339	2.16	375
Pit 2-6	N2-2	5	339.417	339.3	2.34	375
N2-2	N2-3	8	339.3	339	3.75	750
Pit 3-1	Pit 3-2	3	339.411	339.05	12.03	300
Pit 3-2	Pit 3-3	14.5	339.005	338.881	0.86	375
Pit 3-3	N 4-4a	5	338.888	338.7	3.76	375
N 4-4a	N3-4	142	338.7	337.4	0.92	750
Pit 4-1	Pit 4-2	27	339.189	336.836	8.71	375
Pit 4-2	Pit 4-3	6	336.86	336.669	3.18	375
Pit 4-3	Pit 4-4	22	336.626	336.2	1.94	375
Pit 4-4	Pit 4-5	15	336.2	335.87	2.2	375
Pit 4-5	N4-6a	21	335.852	335.4	2.15	375
N4-6a	N4-6	68	335.4	333.6	2.65	450
Pit 4-7	Pit 4-5	13	336.454	335.852	4.63	375
Pit 2-0	Pit 2-1	2	343.084	342.05	51.7	750
Pit 2-1	N2-2	73.5	342.05	339.3	3.74	750
HW 2-0d	N270	22	345.543	344.874	3.04	600
HW 4-1d	N 4-1j	12.1	342.151	341.654	4.11	300
HW 4-1f	N 4-1h	11	342.297	341.653	5.85	300
B F1-2	N Fm1-3	14.5	369.18	369.118	0.43	1.2W x 0.6H

Catchment and Overflow Routes

Catchment delineation using 5m topographic contours, survey information undertaken as part of the Truro Stormwater Management Plan and the road network which identifies the locations of the existing, Catchments were defined at inlet nodes, junction of multiple flow paths or where a significant change in channel cross section. DRAINS Catchment plan used the developed catchment plan for the basis of the DRAINS catchments

Overflow routes were assessed from each inlet point, additional overflow routes were created where channels capacities were exceeded and flow was to another catchment. Discharge relationships were derived for these locations using the channel capacity and custom pits.

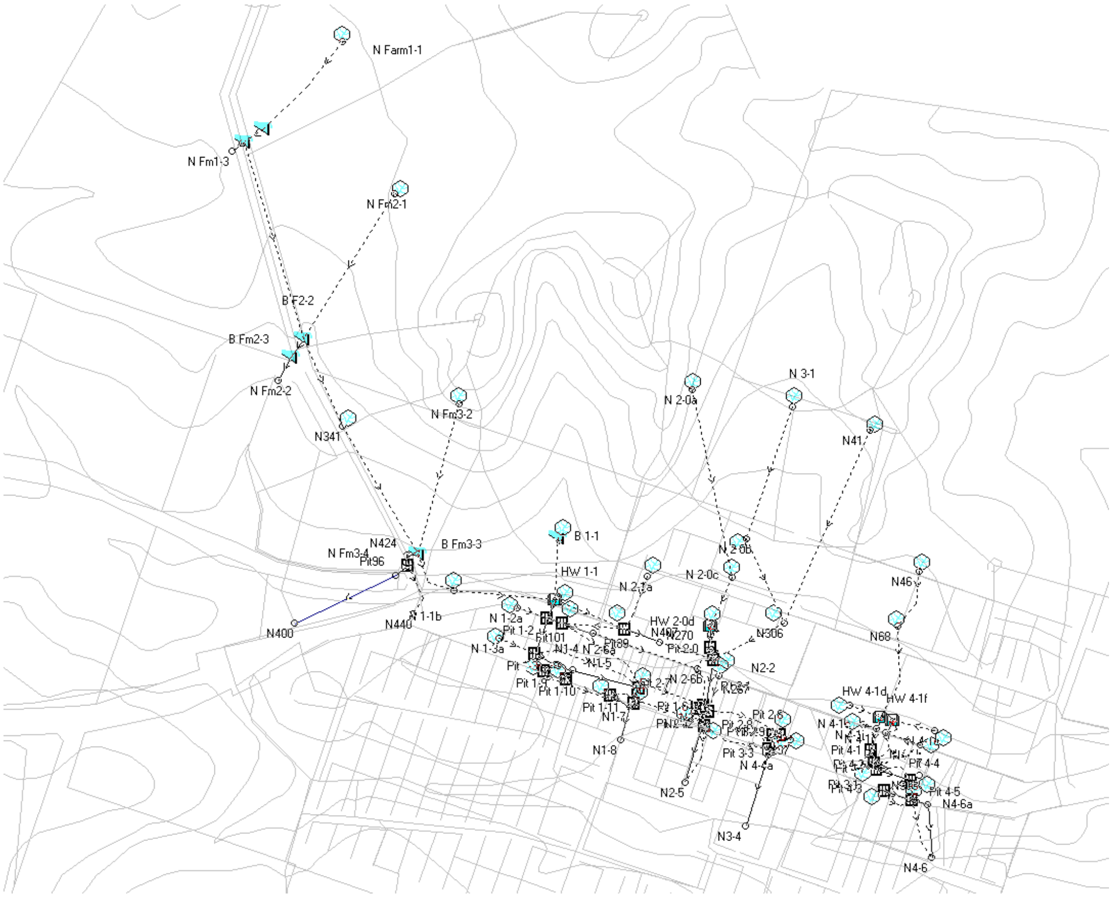


Figure 5: DRAINS Catchment and Overflow Plan

Figure 6: DRAINS Catchment and Overflow Plan Moorundie Street

Table 3: Catchment Details

Name	Total Area (ha)	Paved Area %	Grass Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)
Cat 1-1a	7.64	0	100	5	13	0
Farm1-1	12.29	0	100	5	18.5	0
FM2-1	12.31	0	100	0	20.5	0
Fm3-2	2.43	0	100	5	9.5	0
Cat 3-1	7.07	0	100	5	10.5	0
Cat2-0b	0.44	15	85	5	6	0
Cat 2-0a	2.44	0	100	5	10	0
Cat 3-3	1.95	0	100	5	8.5	0
4-1a	1.83	0	100	5	9.5	0
4-1b	2.16	25	75	5	10	0
4-1c	0.93	10	90	5	10	0
Cat 1-1b	1.54	10	90	5	6	0
Cat 1-1	0.51	5	95	5	6	0
Cat 1-6	0.72	30	70	5	9	0
Cat1-10	0.44	50	50	5	6	0
Cat 1-12	0.03	80	20	5	5	0
Cat 1-11a	0.05	80	20	5	5	0
Cat1-9a	1.8	40	60	5	10	0
Cat 2-9	0.11	50	50	5	6	0
Cat 2-7	0.45	50	50	5	6	0
Cat 3-2	0.32	60	40	5	6	0
Cat 3-3	0.11	80	20	5	6	0
Cat 4-3	0.53	65	35	5	7	0
Cat 4-4	0.29	30	70	5	7	0
Cat 4-5	0.04	80	20	5	6	0
Cat4-7	0.11	80	20	5	6	0
Cat 2-1	1.44	10	90	10	15	0
Cat-1-2a	0.11	80	20	5	7	0
Cat2-1a	1.1	15	85	5	6	0
Cat 2-8a	0.16	80	20	5	6	0
Cat2-0d	1.08	15	85	5	6	0
Cat2-0c	0.35	35	65	5	6	0
Cat 4-1i	0.17	80	20	5	6	0
Cat 4-1e	0.94	10	90	5	10	0
Cat 4-1g	0.15	60	40	5	6	0
Cat1-3a	0.8	25	75	5	6	0
Cat3-1a	0.53	50	50	5	6	0
Cat 4-3	1.07	17	83	5	10	0
Fm3-1	1.86	0	100	5	7	0
Cat 2-1b	0.74	20	80	5	6	0
Cat 2-6a	0.23	80	20	6	10	0

Table 4: Existing Stormwater Network Pipe Peak Flows

U/S Node	Max Q 2 Year	Max Q 5 Year	Max Q 10 Year	Max Q 20 Year	Max Q 50 Year	Max Q 100 Year
B Fm2-3	0.246	0.423	0.469	0.501	0.531	0.556
N Fm2-2	0.245	0.423	0.51	0.512	0.53	0.555
N Fm1-3	0.194	0.409	0.764	1.112	1.508	1.785
Pit 1-2	0.235	0.297	0.308	0.325	0.34	0.352
N 4-1j	0.125	0.129	0.137	0.145	0.151	0.157
N 4-1h	0.08	0.096	0.105	0.113	0.12	0.126
N3-4	0.155	0.155	0.155	0.155	0.155	0.155
N1-8	0.417	0.562	0.67	0.72	0.766	0.812
N2-3	0.499	0.534	0.579	0.622	0.662	0.695
N2-4	0.565	0.635	0.746	0.852	0.945	0.979
N2-5	0.59	0.661	0.772	0.878	0.971	1.005
N4-6	0.261	0.327	0.349	0.349	0.349	0.349
Pit 1-11	0.142	0.155	0.184	0.216	0.24	0.266
N1-7	0.194	0.214	0.26	0.259	0.26	0.26
N1-7	0.016	0.019	0.027	0.041	0.05	0.058
Pit 1-3	0.24	0.303	0.316	0.329	0.347	0.361
Pit 1-6	0.25	0.325	0.342	0.358	0.372	0.389
N1-7	0.268	0.358	0.387	0.432	0.483	0.525
Pit 1-10	0.074	0.08	0.093	0.108	0.12	0.133
Pit 2-1	0.083	0.103	0.128	0.153	0.175	0.19
N2-2	0.477	0.497	0.522	0.548	0.569	0.584
N2-2	0.027	0.045	0.072	0.089	0.103	0.112
N2-3	0.036	0.057	0.095	0.131	0.156	0.156
N2-3	0.03	0.049	0.082	0.114	0.135	0.135
N2-4	0.026	0.026	0.026	0.026	0.026	0.026
Pit 3-2	0.056	0.056	0.056	0.056	0.056	0.056
Pit 3-3	0.113	0.113	0.113	0.113	0.113	0.113
N 4-4a	0.155	0.155	0.155	0.155	0.155	0.155
Pit 4-2	0.116	0.12	0.128	0.137	0.144	0.151
Pit 4-3	0.16	0.17	0.17	0.17	0.17	0.17
Pit 4-4	0.168	0.168	0.167	0.168	0.169	0.169
Pit 4-5	0.254	0.254	0.251	0.254	0.249	0.249
N4-6a	0.261	0.327	0.349	0.349	0.349	0.349
Pit 4-5	0.017	0.071	0.103	0.111	0.116	0.118
B Fm2-3	0.246	0.423	0.469	0.501	0.531	0.556
N Fm2-2	0.245	0.423	0.51	0.512	0.53	0.555
N Fm1-3	0.194	0.409	0.764	1.112	1.508	1.785
Pit 1-2	0.235	0.297	0.308	0.325	0.34	0.352

Table 5: Pit inflow and Overflow Details for Existing Catchment

	2 Year		5 Year		10 Year		20 Year		50 Year		100 Year	
Name	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)
Pit 1-10	0.15	0.082	0.178	0.102	0.249	0.158	0.341	0.233	0.507	0.374	Pit 1-10	0.15
Pit 1-11	0.089	0.03	0.11	0.043	0.167	0.09	0.244	0.198	0.388	0.394	Pit 1-11	0.089
Pit 1-12	0.035	0.019	0.047	0.028	0.095	0.068	0.204	0.164	0.402	0.344	Pit 1-12	0.035
Pit 1-2	0.018	0.008	0.019	0.008	0.023	0.011	0.028	0.015	0.041	0.025	Pit 1-2	0.018
Pit 1-3	0.067	0.047	0.092	0.068	0.136	0.106	0.184	0.149	0.261	0.219	Pit 1-3	0.067
Pit 1-6	0.101	0.071	0.134	0.098	0.25	0.201	0.7	0.616	2.155	2.007	Pit 1-6	0.101
Pit 1-9	0.172	0.098	0.196	0.117	0.261	0.168	0.344	0.236	0.504	0.371	Pit 1-9	0.172
Pit 2-0	0.187	0.104	0.277	0.174	0.41	0.282	0.576	0.423	0.907	0.717	Pit 2-0	0.187
Pit 2-1	0.516	0.122	0.787	0.392	1.344	0.95	1.851	1.456	2.967	2.573	Pit 2-1	0.516
Pit 2-6	0.141	0.115	0.408	0.362	1.009	0.937	1.515	1.427	2.632	2.519	Pit 2-6	0.141
Pit 2-7	0.16	0.124	0.391	0.334	1.032	0.937	1.938	1.807	4.481	4.332	Pit 2-7	0.16
Pit 2-8	0.138	0.108	0.346	0.297	0.948	0.867	1.815	1.701	4.347	4.217	Pit 2-8	0.138
Pit 2-9	0.076	0.047	0.189	0.164	0.774	0.749	1.605	1.579	4.158	4.133	Pit 2-9	0.076
Pit 3-1	0.19	0.133	0.336	0.28	0.917	0.86	1.74	1.684	4.288	4.231	Pit 3-1	0.19
Pit 3-2	0.133	0.077	0.28	0.223	0.86	0.804	1.684	1.627	4.231	4.175	Pit 3-2	0.133
Pit 3-3	0.091	0.048	0.228	0.185	0.811	0.768	1.636	1.593	4.184	4.141	Pit 3-3	0.091
Pit 4-1	0.144	0.028	0.149	0.03	0.162	0.035	0.177	0.041	0.203	0.052	Pit 4-1	0.144
Pit 4-2	0.138	0.09	0.229	0.169	0.422	0.37	0.662	0.62	1.137	1.108	Pit 4-2	0.138
Pit 4-3	0.156	0.197	0.226	0.323	0.441	0.586	0.719	0.865	1.245	1.392	Pit 4-3	0.156
Pit 4-4	0.217	0	0.341	0.186	0.615	0.46	0.9	0.745	1.445	1.29	Pit 4-4	0.217
Pit 4-5	0.008	0	0.126	0	0.394	0.302	0.683	0.591	1.241	1.149	Pit 4-5	0.008
Pit 4-7	0.018	0.001	0.194	0.123	0.47	0.391	0.758	0.679	1.312	1.233	Pit 4-7	0.018
Pit 1-10	0.15	0.082	0.178	0.102	0.249	0.158	0.341	0.233	0.507	0.374	Pit 1-10	0.15
Pit 1-11	0.089	0.03	0.11	0.043	0.167	0.09	0.244	0.198	0.388	0.394	Pit 1-11	0.089
Pit 1-12	0.035	0.019	0.047	0.028	0.095	0.068	0.204	0.164	0.402	0.344	Pit 1-12	0.035

Figure 7: Proposed Remediate Stormwater Network Concept (option 1)

Figure 7: Proposed DRAINS Stormwater Network Layout

Table 6: Proposed Stormwater Remediation works Pits (option 1)

Name	Type	Size	Surface
			Elev (m)
HW 1-1	Headwall		346.508
HW 2-0d	Headwall		346.5
HW 4-1d	Headwall		342.664
HW 4-1f	Headwall		342.61
Pit 1-10	OnGrade	1-10 0.2x1.9 1%	341.213
Pit 1-11	OnGrade	1-11 0.17x1.9 0.5%	340.619
Pit 1-12	OnGrade	1-12 0.12x0.9 1%	340.463
Pit 1-2	OnGrade	1-2&1-3 0.1x0.9-1.5%	346.118
Pit 1-3	OnGrade	1-2&1-3 0.1x0.9-1.5%	341.919
Pit 1-6	OnGrade	1-6 0.15x0.9 0.75%	340.563
Pit 1-9	OnGrade	1-9 0.15x1.9 1%	341.632
Pit 2-0	OnGrade	2-1 0.375x3 4%	343.87
Pit 2-1	Sag	2-1 0.375x3 4%	342.97
Pit 2-6	OnGrade	2-6 0.2x0.9 3.5%	340.382
Pit 2-7	OnGrade	2-7 0.15x0.9 1%	340.074
Pit 2-8	OnGrade	2-8 0.12x0.9 1.5	339.989
Pit 2-9	OnGrade	1-11 0.17x1.9 0.5%	339.674
Pit 3-1	Sag	3-1 & 3-3	339.792
Pit 3-2	Sag	3-1 & 3-3	339.782
Pit 3-3	Sag	3-1 & 3-3	339.508
Pit 4-1	OnGrade	4-1 900x900 grate 9%	340.074
Pit 4-2	OnGrade	4-2 150x2000 5%	337.806
Pit 4-3	OnGrade	4-3 130x1000 2%	337.62
Pit 4-4	Sag	4-3a	337.485
Pit 4-5	Sag	4-4-950x100-sag	337.31
Pit 4-7	OnGrade	4-5 950x2000 2%	337.35
Pit1-10a	OnGrade	Double Pit	341.213
Pit1-10b	OnGrade	Double Pit	340.563
Pit2-1a	Sag	Grate - Sag 900x900	342.97
Pit2-7	OnGrade	Double Pit	340.074
Pit2-8a	OnGrade	Double Pit	339.989
HW 1-1	Headwall		346.508
HW 2-0d	Headwall		346.5

Table 7: Proposed Stormwater Remediation works Pipe Details (option 1)

From	To	Length	U/S IL	D/S IL	Slope	Diameter	No. Pipes
		(m)	(m)	(m)	(%)	(mm)	
B 1-1	N465	5	351.2	351	4	225	1
B F2-2	B Fm2-3	40	362.006	361.595	1.03	675	2
B Fm2-3	N Fm2-2	40	360.687	360.115	1.43	675	2
B Fm3-3	N424	20	350.61	350.45	0.8	0.75W x 0.3H	2
HW 1-1	Pit 1-2	13	345.348	345	2.68	375	1
Pit 1-2	Pit 1-3	52	345	341.053	7.59	450	1
Pit 1-3	N1-4	13	341.029	340.6	3.3	525	1
N1-4	N1-5	36	340.6	340.2	1.11	525	1
N1-5	Pit 1-6	82	340.2	339.65	0.67	525	1
Pit 1-6	N1-7	17	339.518	339.2	1.87	600	2
N1-7	N1-8	129	339.2	336.71	1.93	900	1
Pit 1-12	N1-7	3.5	340.025	339.2	23.57	375	1
Pit 1-9	Pit 1-10	32	340.697	340.299	1.24	525	1
Pit 1-10	Pit 1-11	55	340.299	339.711	1.07	525	1
Pit 1-11	N1-7	25	339.711	339.2	2.04	525	1
Pit 2-9	N2-4	12	338.784	338.6	1.53	375	1
N2-4	N2-5	110	338.6	336.74	1.69	900	1
Pit 2-6	N2-2	5	339.417	339.3	2.34	375	1
N2-2	N2-3	8	339.3	339	3.75	750	1
N2-3	N2-4	12	339	338.6	3.33	750	1
Pit 3-1	Pit 3-2	3	339.411	339.05	12.03	300	1
Pit 3-2	Pit 3-3	14.5	339.005	338.881	0.86	375	1
Pit 3-3	N 4-4a	5	338.888	338.7	3.76	375	2
N 4-4a	N3-4	142	338.7	337.4	0.92	750	1
Pit 4-1	Pit 4-2	27	339.189	336.836	8.71	375	1
Pit 4-2	Pit 4-3	6	336.86	336.669	3.18	375	1
Pit 4-3	Pit 4-4	22	336.626	336.2	1.94	375	2
Pit 4-4	Pit 4-5	15	336.2	335.87	2.2	375	2
Pit 4-5	N4-6a	21	335.852	335.4	2.15	375	2
N4-6a	N4-6	68	335.4	333.6	2.65	450	2
Pit 4-7	Pit 4-5	13	336.454	335.852	4.63	375	1
Pit 2-0	Pit 2-1	2	343.084	342.05	51.7	750	1
Pit 2-1	N2-2	73.5	342.05	339.3	3.74	750	2
HW 2-0d	N270	22	345.543	344.874	3.04	600	1
HW 4-1d	N 4-1j	12.1	342.151	341.654	4.11	300	1
HW 4-1f	N 4-1h	11	342.297	341.653	5.85	300	1
FM 1-2	N Fm1-3	14.5	369.18	369.118	0.43	1.2W x 0.6H	2
Pit1-10b	Pit 1-6	5	339.7	339.65	1	375	1
Pit2-8a	Pit 2-8	5	339.25	339.216	0.68	375	1
Pit 2-8	N2-3	10	339.216	339	2.16	375	1
Pit2-1a	Pit 2-1	5	342.15	342.05	2	450	1
Pit1-10a	N1-5	7	340.299	340.2	1.41	375	1
Pit2-7	Pit 2-7	10	339.3	339.157	1.43	375	1
Pit 2-7	N2-3	10	339.157	339	1.57	375	1
N530	N41	20	357	356	5	225	1

Table 8: Proposed Stormwater Network Peak Flows (Option 1)

U/S Node	Max Q 2 Year	Max Q 5 Year	Max Q 10 Year	Max Q 20 Year	Max Q 50 Year	Max Q 100 Year
B 1-1	0	0.05	0.068	0.081	0.102	0.112
B F2-2	0	0.435	0.769	1.025	1.41	1.558
B Fm2-3	0	0.429	0.761	1.011	1.394	1.533
B Fm3-3	0.001	0.295	0.494	0.686	0.928	1.1
HW 1-1	0.025	0.205	0.295	0.3	0.306	0.31
Pit 1-2	0.032	0.213	0.304	0.31	0.318	0.323
Pit 1-3	0.044	0.235	0.33	0.34	0.355	0.363
N1-4	0.044	0.235	0.33	0.34	0.355	0.363
N1-5	0.058	0.282	0.393	0.414	0.439	0.455
Pit 1-6	0.088	0.344	0.486	0.528	0.577	0.607
N1-7	0.225	0.537	0.749	0.813	0.875	0.914
Pit 1-12	0.006	0.019	0.027	0.036	0.05	0.059
Pit 1-9	0.055	0.08	0.093	0.102	0.12	0.133
Pit 1-10	0.103	0.155	0.184	0.203	0.24	0.252
Pit 1-11	0.133	0.214	0.26	0.259	0.26	0.26
Pit 2-9	0.008	0.034	0.056	0.078	0.128	0.152
N2-4	0.204	0.873	1.296	1.457	1.573	1.635
Pit 2-6	0	0.004	0.021	0.029	0.049	0.06
N2-2	0.151	0.829	1.135	1.177	1.212	1.222
N2-3	0.197	0.846	1.247	1.381	1.463	1.487
Pit 3-1	0.062	0.111	0.121	0.121	0.121	0.121
Pit 3-2	0.062	0.111	0.161	0.196	0.226	0.226
Pit 3-3	0.068	0.12	0.172	0.208	0.269	0.269
N 4-4a	0.068	0.12	0.172	0.208	0.269	0.269
Pit 4-1	0.026	0.057	0.076	0.09	0.117	0.134
Pit 4-2	0.042	0.086	0.112	0.131	0.165	0.187
Pit 4-3	0.064	0.117	0.15	0.173	0.216	0.244
Pit 4-4	0.096	0.187	0.233	0.27	0.32	0.348
Pit 4-5	0.11	0.207	0.257	0.322	0.422	0.498
N4-6a	0.11	0.207	0.257	0.322	0.422	0.498
Pit 4-7	0.012	0.017	0.02	0.045	0.074	0.086
Pit 2-0	0.013	0.044	0.057	0.065	0.075	0.084
Pit 2-1	0.124	0.808	1.035	1.049	1.052	1.052
HW 2-0d	0.013	0.063	0.097	0.122	0.155	0.192
HW 4-1d	0.007	0.034	0.052	0.072	0.1	0.117
HW 4-1f	0.007	0.034	0.052	0.069	0.075	0.08
Pit1-10b	0.015	0.043	0.062	0.074	0.09	0.099
Pit2-8a	0.02	0.042	0.054	0.085	0.092	0.092
Pit 2-8	0.034	0.063	0.078	0.12	0.129	0.129
Pit2-1a	0.036	0.166	0.173	0.168	0.174	0.172
Pit1-10a	0.015	0.051	0.066	0.074	0.084	0.094
Pit2-7	0	0.01	0.033	0.048	0.069	0.077
Pit 2-7	0.015	0.031	0.055	0.088	0.127	0.145
B 1-1	0	0.05	0.068	0.081	0.102	0.112
B F2-2	0	0.435	0.769	1.025	1.41	1.558
B Fm2-3	0	0.429	0.761	1.011	1.394	1.533

Table 9: Pit inflow and Overflow Details for Stormwater Network Concept (Option 1)

	2 Year		5 Year		10 Year		20 Year		50 Year		100 Year	
Name	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)	Max Surface Flow (m^3/s)	Overflow (m^3/s)
Pit 1-10	0.08	0.03	0.18	0.10	0.25	0.16	0.30	0.20	0.42	0.30	0.51	0.39
Pit 1-11	0.04	0.00	0.11	0.04	0.17	0.09	0.21	0.16	0.31	0.29	0.40	0.40
Pit 1-12	0.01	0.00	0.05	0.03	0.10	0.07	0.16	0.13	0.30	0.25	0.41	0.35
Pit 1-2	0.01	0.00	0.02	0.01	0.02	0.01	0.03	0.02	0.03	0.02	0.04	0.03
Pit 1-3	0.03	0.02	0.09	0.07	0.14	0.11	0.17	0.13	0.21	0.17	0.26	0.22
Pit 1-6	0.03	0.02	0.08	0.05	0.13	0.10	0.17	0.13	0.25	0.20	0.31	0.25
Pit 1-9	0.10	0.05	0.20	0.12	0.26	0.17	0.31	0.21	0.42	0.30	0.50	0.37
Pit 2-0	0.01	0.00	0.06	0.02	0.10	0.04	0.12	0.06	0.16	0.08	0.19	0.11
Pit 2-1	0.01	0.00	0.04	0.00	0.27	0.11	0.37	0.20	0.67	0.50	0.87	0.73
Pit 2-6	0.00	0.00	0.00	0.00	0.08	0.06	0.16	0.13	0.47	0.42	0.71	0.65
Pit 2-7	0.03	0.02	0.06	0.04	0.10	0.07	0.20	0.16	0.49	0.43	0.77	0.68
Pit 2-8	0.04	0.02	0.07	0.05	0.09	0.07	0.19	0.15	0.45	0.39	0.71	0.64
Pit 2-9	0.01	0.00	0.04	0.01	0.08	0.03	0.14	0.07	0.35	0.22	0.73	0.58
Pit 3-1	0.07	0.00	0.12	0.00	0.17	0.05	0.20	0.08	0.43	0.33	0.74	0.63
Pit 3-2	0.00	0.00	0.00	0.00	0.05	0.00	0.08	0.00	0.33	0.21	0.63	0.51
Pit 3-3	0.01	0.00	0.02	0.00	0.02	0.00	0.03	0.00	0.22	0.18	0.53	0.49
Pit 4-1	0.03	0.00	0.06	0.01	0.09	0.01	0.11	0.02	0.15	0.03	0.17	0.04
Pit 4-2	0.02	0.00	0.06	0.03	0.08	0.05	0.10	0.06	0.14	0.09	0.18	0.12
Pit 4-3	0.05	0.03	0.11	0.08	0.15	0.11	0.19	0.15	0.26	0.21	0.32	0.26
Pit 4-4	0.04	0.00	0.11	0.00	0.16	0.00	0.20	0.07	0.28	0.18	0.35	0.24
Pit 4-5	0.01	0.00	0.01	0.00	0.01	0.00	0.05	0.00	0.15	0.00	0.21	0.00
Pit 4-7	0.01	0.00	0.02	0.00	0.02	0.00	0.09	0.04	0.21	0.14	0.28	0.19
Pit1-10a	0.02	0.00	0.07	0.02	0.11	0.04	0.13	0.06	0.17	0.09	0.22	0.13
Pit1-10b	0.02	0.00	0.05	0.01	0.10	0.03	0.13	0.06	0.20	0.11	0.25	0.16
Pit2-1a	0.04	0.00	0.18	0.00	0.27	0.21	0.33	0.30	0.58	0.56	0.76	0.74
Pit2-7	0.00	0.00	0.01	0.00	0.03	0.00	0.06	0.01	0.11	0.04	0.16	0.08
Pit2-8a	0.02	0.00	0.05	0.01	0.07	0.02	0.15	0.07	0.39	0.33	0.64	0.59
Pit 1-10	0.08	0.03	0.18	0.10	0.25	0.16	0.30	0.20	0.42	0.30	0.51	0.39

Appendix B: MUSIC Modelling Details

Figure 1: MUSIC Model Setup

Infiltration Basins

High flow bypass:	0.001m^3/s
Surface Area:	20m^2
Depth to overflow weir:	0.05m
Infiltration rate:	(sand) 180mm/hr
Evaporation Loss as PET:	100%
Overflow Weir Width:	2m

Gross Pollutant Trap

High Flow Bypass: 0.05m^3/s (approximately 1 in 3 month flow)

	Removal efficiency
TSS	80%
TP	30%
TN	30%

Urban Water Quality Run off Parameters

		TSS	TP	TN
Base Flow	mean (log mg/L)	0.53	-1.54	0.52
	St Dev (log mg/L	0.24	0.38	0.39
Storm Flow	mean (log mg/L)	2.256	0.56	0.32
	St Dev (log mg/L	0.51	0.28	0.3

Agricultural Land Water Quality Run off Parameters

		TSS	TP	TN
Base Flow	mean (log mg/L)	1.4	-0.88	0.074
	St Dev (log mg/L	0.13	0.13	0.13
Storm Flow	mean (log mg/L)	2.3	0.27	0.59
	St Dev (log mg/L	0.31	0.3	0.26

Source Node Properties

Impervious rainfall Threshold (mm/day)	1
Soil storage capacity (mm)	120
initial storage (% of Capacity)	30
Field Capacity (mm)	80
Infiltration Capacity Coefficient -a	200
Infiltration Capacity Exponent -b	1

Appendix C: Key Legislation and Policy Documents

The Local Government (Stormwater Management) Amendment Act 2007:

http://www.lga.sa.gov.au/webdata/resources/files/Local_Government_(Stormwater_Management)_Amendment_Bill_2007__-_Final_form.pdf

The Natural Resources Management Act 2004:

http://www.legislation.sa.gov.au/LZ/C/A/NATURAL%20RESOURCES%20MANAGEMENT%20ACT%202004/CURRENT/2004.34.UN.PDF

The Environment Protection Act 1993:

http://www.legislation.sa.gov.au/LZ/C/A/ENVIRONMENT%20PROTECTION%20ACT%201993/CURRENT/1993.76.UN.PDF

Development Act (and Regulations) 1993

Environment Protection (Water Quality) Policy 2003

Stormwater Management Planning Guidelines: Stormwater Management Authority (2007). Stormwater Management Planning Guidelines. July 2007.

Government of South Australia (2005). Urban Stormwater Management Policy for South Australia. May 2005.

Planning SA (2003). Guidelines for Urban Stormwater Management. Planning SA 2003

Urban Water Resources Centre (2005). Water Sensitive Urban Design: A Handbook for Australian Practice. University of South Australia in association with the Stormwater Industry Association and the Australian Water Association April 2005.

ANZECC (Australian & New Zealand Environment & Conservation Council) (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Environment Australia, Canberra.

Environment Australia (2002) Water Quality Targets: A Handbook, Commonwealth of Australia, Canberra.

Local Government Association South Australia (LGA, 2006) Document 5 - Cost Apportionment Guidelines. Downloadable from http://www.lga.sa.gov.au/site/page.cfm?u=575

Local Government Association South Australia (LGA, 2006) Document 6 – Guideline Framework for Uniform Catchment based Stormwater Management Planning by Local Government Councils. Endorsed by NRM Council for use by Local Government Councils, August 2006. Downloadable from http://www.lga.sa.gov.au/site/page.cfm?u=575

Appendix D: Summary of Consultation Outcomes

MID MURRAY COUNCIL

28th April 2008 at Truro Oval Clubrooms

Attendees:

- Dean Gollan, CEO Mid Murray Council
- Kelvin Goldstone, Manager Environmental Services Mid Murray Council
- Jon Fry, Works Manager Mid Murray Council
- Ross Dawkins, Truro Community Association
- Reg Munchenberg, Truro Community Association
- Mick Anderson, Truro Community Association

Objectives of the Meeting:

- Background of the project
- Vision for the Council and community regarding water management
- Expectations of the project
- Set objectives for the IWRMP
- Priority issues and constraints and targeted outcomes
- Timeframes
- Date for community workshop

Outcomes:

Expectations

- Want report to take information to next level such as specific information on which projects should be implemented on the ground.
- Practical outcomes that can be implemented.
- Need to report on achievable options.
- Need cost information so that decisions can be made and Council can compare the cost effectiveness of options.
- Report needs to be able to support future grant applications.

Vision and Objectives

- Reduce reliance on the River Murray.
- Reduce flooding.
- Reduce impact from current wastewater disposal practices.

- Cater for future growth.
- Educate the community.

ENVIRONMENT PROTECTION AUTHORITY

Attendees:

- Peter Newland, Senior Project Officer Water Quality
- Peter Scott, Senior Policy Officer, Stormwater
- John Dunsford, Manager Processing and Wastewater
- Chris Brown, Senior Environment Protection Officer

Objectives:

- Determine any ASR implications
- CWMS
- Permits / licences
- Changes to legislation / policy
- Setback distances

Outcomes:

- New EPA Code of Practice for ASR will be out later in the year. It is based on a risk assessment approach that is consistent with the National Guidelines
- DWLBC will licence ASR and put conditions on
- Trying to use the National terminology of "Managed Aquifer Recharge (MAR)"
- Stormwater Guidelines developed for South East would be applicable due to similar groundwater situation
- Any monitoring requirements for ASR will be based on the risk assessment (eg if high risk then high monitoring and vice versa)
- Need to have a good handle on where the water will be going if injected
- Stormwater quality issues in terms of levels of herbicides used
- Water quality policy is currently under review but no foreseen implications for this project
- Look for opportunities for dual reticulation instead of infrastructure on individual sites
- Need to recognise and plan for potential salinity issue over time with regards to wastewater
- Capacity building could go a long way to improving water quality (such as encouraging supermarkets not to stock detergents with

high salt content and encouraging hardware stores not to stock pesticides and herbicides with harmful substances)

- Follow risk assessment approach for ASR with wastewater
- Need to understand the catchment to understand the risks
- Issues with Irrigation Management Plans (IMPs) if reuse occurs on small scales. EPA currently looking at legislative changes
- Water quality policy currently being reviewed but that should not have any implications for this project.
- Good examples elsewhere of where wastewater reuse has been successful such as Coffs Harbour and Willunga Basin

DEPARTMENT OF HEALTH

Attendees:

- Nina Allen
- Tony Farror

Objectives:

Determine requirements for approvals etc if treated wastewater and stormwater reuse schemes are implemented.

Key Questions:

Basis for approvals:

- Meeting new Reclaimed Water Guidelines Criteria

Outcomes:

- Need to satisfy all relevant sections of the new Reclaimed Water Guidelines – risk minimisation is the key factor that would need to be addressed.
- No major concerns if reuse projects developed and submitted as per normal for such schemes in SA
- Set-back distances require to be addressed
- DH would work in with EPA as projects developed and presented to agencies
- Stormwater reuse concepts would also need to be considered

SA WATER

Phone conversation with Paul Doherty, Manager Systems Planning

Objectives:

To develop an understanding of SA Water's present and future strategies re water supply for the township.

<u>Outcomes:</u>

- Will continue to maintain the existing infrastructure
- Water supply infrastructure to be provided on an as needs basis
- Not aware of any issues with the existing system or that there would be any difficulties with providing future supply, based on current growth scenarios. Capacity should not be a problem.

DEPARTMENT OF WATER, LAND AND BIODIVERSITY CONSERVATION

<u>Phone Conversation with Paul Fitzpatrick (DWLBC – Murray Bridge)</u>

Re: ASR licensing in the Truro region

<u>Key Questions:</u>

- Are there any special licensing requirements for ASR permit in the Truro area, if so what are they?
- Are there any water quality criteria for the injected water or exclusion zones?

<u>Outcomes:</u>

- The application processes is the same as for other ASR sites, such that water samples from the ambient aquifer and water intended for injection need to be submitted to DWLBC along with relevant information regarding the ASR operation as outlined in the license application form.
- DWLBC assess ASR license application on a case by case basis. So there are no set or strict exclusion zone
- Water intended for injection must have total dissolved solid concentration below 1500 mg/L
- No other specific water quality criteria are currently in place, again the quality of the water intended for injection is assessed on a case by case basis.

<u>Phone Conversation with Steve Barnett (DWLBC)</u>

Re: Information on groundwater in the Truro region

<u>Key Questions:</u>

- Are there any reports relating to groundwater in the Truro region?

Outcomes:

- There are no current reports on this region. The Department (DWLBC) hasn't produced any reports on the area.

South Australian Murray Darling Basin Natural Resources Management Board

Phone conversation with Simon Sherriff, Principal Project Officer (Local Government)

Key Questions:

- Update on the progress of the development of the NRM Plan
- Information on funding opportunities

Outcomes:

- Need to demonstrate various aspects for funding bids:
  - Public good
  - Drought proofing
  - Water security
  - Climate change
  - Returning water to the environment
- How water can be returned to the environment is a key federal focus
- Need to explore ways of how can guarantee that water saved (through conservation or utilising alternative sources) can be provided for the environment and not reallocated
- Need a flexible approach to be able to adapt to varying funding types
- LGA funds is also an opportunity
- Easier to obtain NRM funds if used for separate projects than from LGA funds but there are no restrictions

Adelaide and Mt Lofty Ranges Natural Resources Management Board

Phone conversation with Stephen Smith, Director Policy and Planning

27th June 2008

Not able to think of any connections with the Adelaide and Mt Lofty Ranges NRM Board for Truro.

STORMWATER MANAGEMENT AUTHORITY

Phone conversation with Terry Stewart, General Manager

Key Questions:

- Are there funds still available?
- Is it possible for an integrated water management plan to be approved in a similar manner as the stormwater management plan for the purposes of putting in a funding application?
- What is the likelihood of a funding application being approved for catchments less than 40 ha and for funding to be approved without a stormwater management plan?
- In the SMA Meeting #5 Minutes (19th February 2008) point 6 refers to funding in relation to education, research and data collection – clarification of what this refers to and whether funding applications still need to have main focus on flooding?

Outcomes:

- The SMA are able to approve funds in the absence of a stormwater management plan and for catchments less than 40 ha
- An IWRMP would not be able to be approved as a stormwater management plan
- However, the SMA recognise that council's should not have to develop stormwater management plans unless they really need to
- The SMA would be able to receive an application for funding on the basis of an integrated water management plan
- The only information that is assessed is what is included in the application
- The merit of the project needs to be focused around flooding
- A few research and education projects have been funded but they have to predominantly relate to flooding
- 25 applications have been approved to date (11 or 12 in regional areas)
- Funding can be jointly funded (i.e. with the Feds)
- The SMA currently meet every second month

DEPARTMENT FOR TRANSPORT, ENERGY AND INFRASTRUCTURE

Phone conversations with:

- Phil Lawes, Network Strategy Manager, Road Transport Policy & Investment Section, Policy & Planning Division
- Chris Hurrell, Acquisition and Disposal Consultant, Rail Portfolio Property Planning & Management Services

Key Questions:

- What is the current status of the Truro bypass
- The ownership and intended future use (or options for use) of the disused railway land / corridor

Outcomes:

- DTEI will be undertaking studies into the potential bypass of Truro in 2008/09. At this time there is no commitment to a bypass
- Given the above studies, the ownership of the disused railway corridor (under the ownership of the Minister for Transport) will be retained for the time being
- Railway corridor has been declared surplus providing it is not required for the bypass
- A Circular 114 process would be undertaken if the land was declared available. Land Management Corporation would send an email to government agencies and councils advising that the land was available for sale at market rates. Council will be able to nominate that they are keen for the land. If keen to purchase can negotiate timeframes.