



## SA Water Major Framework Partner

### Water North Framework

McConnell Dowell Management System

# TRAFFIC MANAGEMENT PLAN

**Doc No:** HSEQ-SYS-PLN022-GEN-2910  
**Client:** SA Water  
**Project:** SA Water Major Framework Partner - Water North Framework  
**Location:** Adelaide, South Australia  
**Project No:** 2910

#### Revision History

| Rev | Date        | Description                                                                 | Author        | Reviewer                  | Approver |
|-----|-------------|-----------------------------------------------------------------------------|---------------|---------------------------|----------|
| A   | 2 Jun 2020  | Issued for Review                                                           | H. Rankine    | K. Stolberger<br>SA Water | M. Doyle |
| B   | 13 Nov 2020 | SA Water Comments Closed                                                    | H. Rankine    | K. Stolberger<br>SA Water | M. Doyle |
| 0   | 23 Nov 2020 | Approved – Issued for Use                                                   | H. Rankine    | K. Stolberger<br>SA Water | M. Doyle |
| 1   | 26 Jul 2022 | Annual review – minor amendments to sections 5.2.3, 5.2.5, 6.2.4, and 6.2.5 | K. Stolberger | S. Pawlowski              | M. Doyle |
| 2   | 9 Nov 2023  | Annual Review – minor amendments to sections 2, 3, 5.2.3, 5.2.4 & 5.2.5     | K Stolberger  | M. Chacko                 | M. Doyle |

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## Table of Contents

|                                                                             |    |
|-----------------------------------------------------------------------------|----|
| 1. ABBREVIATIONS, TERMS AND DEFINITIONS.....                                | 4  |
| 2. PROJECT DESCRIPTION .....                                                | 4  |
| 3. MANAGEMENT SYSTEM .....                                                  | 5  |
| 4. PURPOSE OF THE PLAN.....                                                 | 7  |
| 4.1 Purpose and Structure .....                                             | 7  |
| 4.2 Interface with Other Plans.....                                         | 8  |
| 5. ROLES AND RESPONSIBILITIES .....                                         | 8  |
| 5.1 Traffic Leadership .....                                                | 8  |
| 5.1.1 Traffic Issues Management.....                                        | 10 |
| 5.2 Traffic Responsibilities .....                                          | 10 |
| 5.2.1 Area Managers.....                                                    | 10 |
| 5.2.2 Superintendents .....                                                 | 10 |
| 5.2.3 Site Supervisors .....                                                | 10 |
| 5.2.4 Project Engineers (including Site Engineers) .....                    | 11 |
| 5.2.5 Stakeholder and Communications Advisor .....                          | 11 |
| 6. TRAFFIC MANAGEMENT PLAN .....                                            | 12 |
| 6.1 Traffic Management Plan (TMP).....                                      | 12 |
| 6.2 Working Clearances, Barriers, Control Devices and Advanced Warning..... | 12 |
| 6.2.1 Working Clearances and Barriers .....                                 | 12 |
| 6.2.2 Traffic Control Devices.....                                          | 14 |
| 6.2.3 Advanced Warning.....                                                 | 14 |
| 6.2.4 Site Layout, Access and Traffic .....                                 | 14 |
| 6.2.5 Worker Access.....                                                    | 14 |
| 7. RECORDS .....                                                            | 14 |
| 8. REFERENCES .....                                                         | 15 |

## List of Figures

|                                               |    |
|-----------------------------------------------|----|
| FIGURE 3-1: MANAGEMENT PLANS .....            | 7  |
| FIGURE 6-1: TYPICAL SAFE WORK CLEARANCES..... | 14 |

## List of Tables

|                                                      |   |
|------------------------------------------------------|---|
| TABLE 1-1: ABBREVIATIONS, TERMS AND DEFINITIONS..... | 4 |
|------------------------------------------------------|---|

|                                                    |    |
|----------------------------------------------------|----|
| TABLE 2-1: DELIVERING CAPITAL TOGETHER MODEL ..... | 5  |
| TABLE 7-1: RECORDS .....                           | 14 |
| TABLE 8-1: REFERENCES.....                         | 15 |

## 1. ABBREVIATIONS, TERMS AND DEFINITIONS

A comprehensive list of definitions, interpretations and acronyms can be found in the Head Contract. Words and phrases defined or referred to in the Head Contract have the same meaning when used in this plan and other Management Plans.

Any additional definitions, interpretations and acronyms that are specific to the Project, or to this plan, and that are not found in the Head Contract, are listed in the table below:

**Table 1-1: Abbreviations, Terms and Definitions**

| Term / Abbreviation | Definition                                                                                       |
|---------------------|--------------------------------------------------------------------------------------------------|
| CEP                 | Construction Execution Procedure                                                                 |
| CMO                 | Compliance Management Organisation                                                               |
| CMP                 | Construction Management Plan                                                                     |
| Framework           | The multiple projects and the overarching agreement under which those projects will be delivered |
| Head Contract       | Means the Framework Agreement in place between SA Water and MDJV                                 |
| JV                  | Joint Venture                                                                                    |
| MDJV                | Diona McConnell Dowell Joint Venture                                                             |
| MFP                 | Major Framework Partner                                                                          |
| MMS                 | McConnell Dowell Management System                                                               |
| MUTCD               | AS 1742 Manual for Uniform Traffic Control Devices                                               |
| PMC                 | Project Management Committee                                                                     |
| PMP                 | Project Management Plan                                                                          |
| TMC                 | Traffic Management Centre                                                                        |
| TMP                 | Traffic Management Plan                                                                          |
| VMS                 | Variable Message Signage                                                                         |
| WTMP                | Workzone Traffic Management Plan                                                                 |

## 2. PROJECT DESCRIPTION

The new SA Water model (Delivering Capital Together) will create deep and long-lasting partnerships with industry specialists through a new framework model. This will see three anticipated Major Framework Partners (MFPs) working closely with SA Water to plan and deliver work, supported by a management structure with shared risk and responsibility. This change is considered essential for improving outcomes for SA Water customers and maintaining low and stable water prices over time.

The new model will streamline how SA Water manages its assets, from planning to delivery, supported with transparent and agile procurement and commercial processes, increased capability from its supply partners and simplified transactions. It will be founded on good governance as it retains and develops the contract management capability within its business.

SA Water is seeking to work collaboratively with its partners. Success will be realised with a long-term, partnership approach, working together to consistently deliver excellent capital program outcomes to 2024 that represent value for money for its customers.

SA Water's partners need to be equally cognisant of their commitment to customers and be willing to work alongside them, as it invests to support how they deliver outcomes for more than 1.7 million people.

From its partners SA Water is seeking a high performing collaborative cultural mindset, willingness to learn and grow together in the effective planning, management and delivery of major projects and capital investment decisions across South Australia. This means that together with the MFPs it will jointly develop greater alignment and integration in decision making, information and performance management.



When it comes to reputation, customers and the community do not see the difference between SA Water and its partners. That's why we need to be one – SA Water – meaning us and partners working together to deliver great outcomes for our customers.

Partners are joining with SA Water and its corporate culture which will be enabled with a One Team, One Brand approach.

To achieve this change, SA Water is placing a strong focus on cultural alignment. By working together, we will be culturally integrated, through the effective onboarding and induction of new people to the planning and delivery of the program and projects.

The procurement of all required services for the new capital delivery model will be delivered through a staged procurement process focusing separately on each of the key service components.

The table below provides an overview of the main procurement processes required to establish the new Delivering Capital Together model:

**Table 2-1: Delivering Capital Together model**

| Procurement Process      | High Level Scope                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Major Framework Partners | <ul style="list-style-type: none"> <li>Three multi-disciplinary design and construction partners.</li> <li>Services supporting the delivery of the RBP20 Capital Plan; with the potential to extend the Services for the 2024-2028 Regulatory Business Period (RBP24).</li> <li>Providing capital planning and delivery services including project, program and construction delivery capability.</li> <li>Providing program leadership capability aimed at bringing supplier capability into the Program Leadership Team (PLT) to assist SA Water in achieving outstanding customer outcomes.</li> <li>Delivering 70 to 80 per cent of capital plan (anticipated) under incentivised contracting arrangements.</li> </ul> |

**Water north program** typically consists of North of Metropolitan Adelaide, Central Northern, Northern region, Eyre region and Main South Road & Victor Harbor Road in the Southern region.

The following key asset types form the largest component of the capital intervention planned under the Major Frameworks in the Water Portfolio.

- Water Earth Bank Storages;
- Water Pump Stations;
- Water Storage Tanks;
- Water Treatment Plants;
- Water Networks; and
- Water Control Valve Installations.

### 3. MANAGEMENT SYSTEM

The McConnell Dowell Diona Joint Venture (MDJV) will operate under the McConnell Dowell Management System (MMS) which is a certified AS/NZS ISO 9001:2016 integrated management system.

The MMS contain all plans, policies, procedures, guidelines, forms and tools to provide a framework mechanism for implementation activities.

For MDJV to perform at a high standard and to industry best practice throughout the delivery of the project, this plan, together with the management plans listed in Figure 3-1, will be used on the project to plan, document, monitor, control, audit and verify that the JV's operations and finished products are in compliance with the following:

- Applicable statutory acts, regulations, guides and codes of practice;
- Head Contract; and
- Applicable Australian and international standards, guides and codes.

The MMS documents are stored on SharePoint, the web-based document control system used by MDJV. It provides a structured environment for locating and using documents, as well as managing the change and approval process. Project documentation will be shared and made available to external parties and stakeholders as per contractual requirements or as necessary through the collaborative electronic documentation management system nominated by SA Water and the Major Framework Partners (Aconex).

Other integrated systems to be used by the JV include Workbench, CMO, etc.

The management plans are documented to include additional management procedures that are considered critical in achieving the project objectives and are written to address resources and issues requiring greater detail for implementation at project level than that provided in corporate procedures.

They provide a detailed description of how MDJV plans to carry out the works in accordance with the requirements of the Head Contract.

All project plans are required to be submitted to either the Framework Manager, Project Management Committee (PMC) or SA Water for review and authorisation prior to controlled distribution.

The requirements set out in the plans are minimum requirements for the project and they are not to be decreased or otherwise reduced in any subsequently amended versions of the plans, unless an approval is sought from the relevant plan approver.

The project plans will be controlled throughout the duration of the Head Contract and will cease being controlled once the project has reached completion.

The list of project plans and approvers can be found in the figure below.

## McConnell Dowell Diona Joint Venture Management Plans

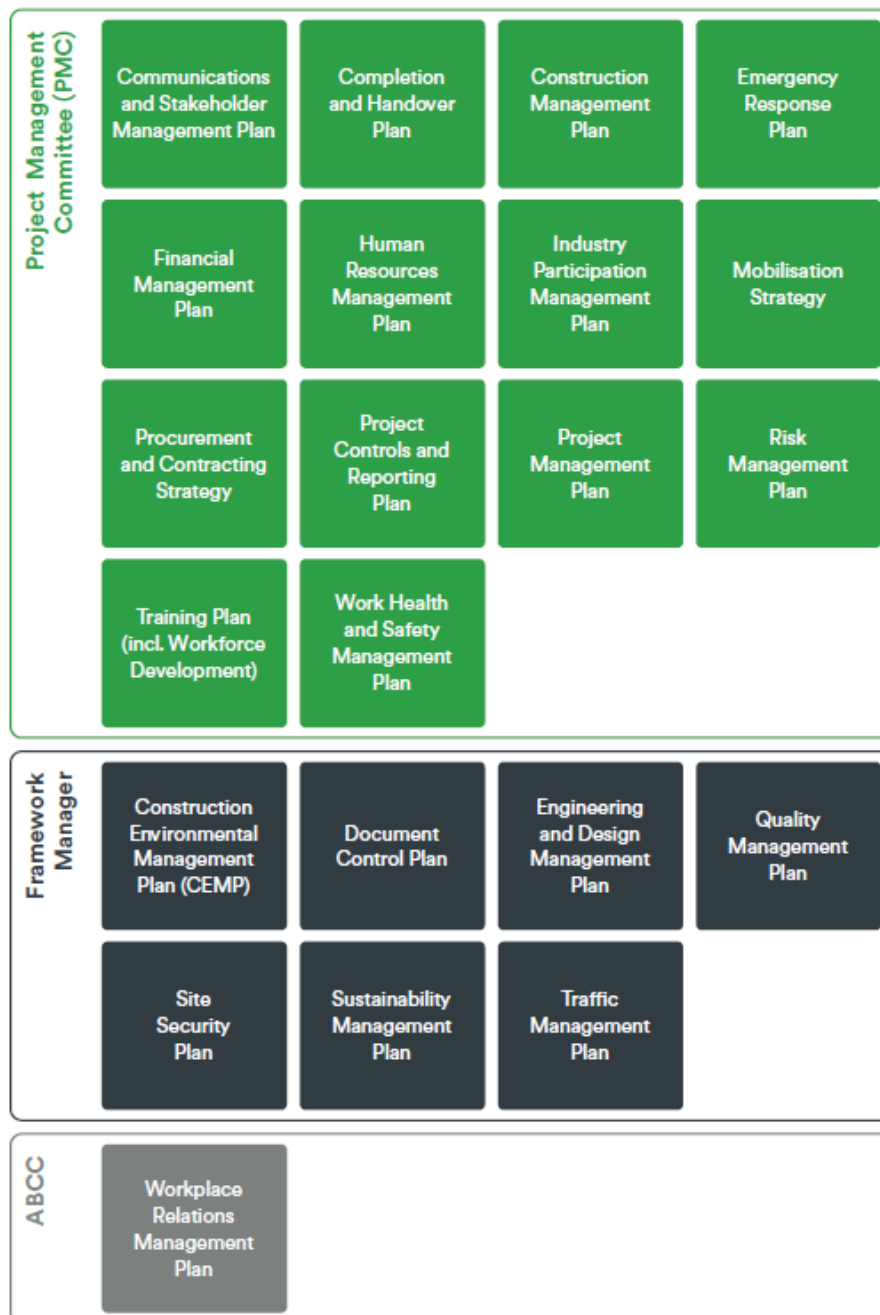


Figure 3-1: Management Plans

## 4. PURPOSE OF THE PLAN

### 4.1 Purpose and Structure

The purpose of this Traffic Management Plan (TMP) is to clearly define the measures we will undertake during the delivery of the project, to ensure:

- The safety of road users and construction traffic;
- Free flowing and consistent traffic movement is achieved at all times;
- Processes to seek and attain permits and provide advice to TMC, DIT Road Works or relevant councils of upcoming traffic impacts are adhered to;
- Traffic impacts related to the construction works are visually monitored;

- A safe interface between construction traffic and local traffic is maintained;
- Elimination of the risk of injury to local traffic users and construction personnel;
- Provision of access to adjoining properties throughout the works;
- Minimal traffic delays and traffic issues; and
- Vehicular, cyclist and pedestrian traffic safety.

This TMP provides practical guidance to Area Managers, Project Engineers and Site Supervisors on the management of the traffic requirements on their projects in line with the SA Standards for Workzone Traffic Management. It also provides an overview of communication requirements, and compliance with the relevant project standards, technical specifications, statutory and regulatory requirements.

The TMP is to be distributed to JV personnel and is to be made available to all site workers including subcontractors.

## 4.2 Interface with Other Plans

The Traffic Management Plan has been developed in conjunction with the Project Management Plan (PMP), other Management Plans and strategic documents required under the Head Contract.

- **Link with Construction Management:** The Construction Management Plan (CMP) provides construction management controls and solutions to carry out construction related activities detailed in the CMP.
- **Link with Mobilisation Strategy:** The Mobilisation Strategy describes the activities that will be undertaken to establish the JV upon award, together with initial procurement tasks to assist the construction teams establish active work fronts.
- **Link with Design:** The design and construction teams will be integrated with design outputs being rapidly issued to the delivery team. The JV's approach to design is detailed in the Engineering and Design Management Plan.
- **Link with Community Engagement:** The community and stakeholder management plan outlines the respective roles and responsibilities of the JV and SA Water with respect to engaging with stakeholders potentially impacted by changes to traffic arrangements.
- This Traffic Management Plan shall be read in conjunction with the McConnell Dowell Safe Operating Procedure for Traffic Management – Planning and Use (MMS ID: HSEQ-HS-SOP018-GEN-ALL)

## 5. ROLES AND RESPONSIBILITIES

The roles and expectations of project personnel are as follows:

### 5.1 Traffic Leadership

The Framework Delivery Manager must exercise their authority to approve this TMP.

The Area Manager is ultimately responsible for the implementation of traffic management strategies in the area under their control and their authority may be delegated to the Project Engineers, and Site Supervisors who are required to participate actively in the field. All Project Engineers and Site Supervisors are directly responsible for traffic management within the project or services performed by their workforce.

The appointed Superintendent, or their designee, is the traffic management representative.

All department and discipline managers are responsible for:

- identifying and evaluating actual or potential problems that may impact traffic;
- ensuring staff awareness and understanding of the TMP and the requirements of any applicable Workzone Traffic Management Plan (WTMP), and provide access as necessary;
- compliance with approved permit conditions as issued by TMC or relevant council;
- establishing and reviewing WTMPs in conjunction with the responsible Project Engineers and Site Supervisors;
- maintaining customer satisfaction through daily construction operations; and
- checking opportunities for improvement of the MMS.



### 5.1.1 Traffic Issues Management

The project teams will discuss traffic related matters during their weekly project meetings. Issues raised during those meetings may be elevated to the Water North Management Team.

As a minimum, the weekly project meetings will comprise the following representatives:

- Area Manager;
- Project and/or Site Engineer; and
- Superintendent or Site Supervisor.

From time to time, representatives of other key traffic stakeholders may be invited to attend those meetings as required. The Area Manager (or delegate) will facilitate and minute the meetings from project award through to the completion.

## 5.2 Traffic Responsibilities

### 5.2.1 Area Managers

Area Managers are responsible for communicating requirements of this TMP to the project team and ensuring compliance. The Area Managers are responsible for the development of the Construction Execution Procedures (CEPs). The Area Manager will ensure project documentation, including but not limited to CEPs and Workzone Traffic Management Plans (WTMPs) are maintained and provided to the TMC, local government authorities and other relevant stakeholders as necessary. The Area Manager is responsible for issuing controlled electronic and hard copies of the TMP.

The Area Manager is responsible for ensuring that the Project Engineers communicate traffic management requirements within required timeframes, including all staging and planning, in accordance with this TMP. This responsibility shall be carried through to the construction team and Traffic Management Sub-Consultant.

### 5.2.2 Superintendents

Superintendents or their delegates are responsible for implementing the CEPs, and WTMPs in accordance with TMC issued permit conditions, including coordinating the implementation and maintenance of the project's traffic management and ongoing requirements for up-to-date and relevant WTMPs. Specific responsibilities include, but are not limited to:

- Ensure that all traffic affected activities have approved WTMPs, TMC and/or relevant council permits, in accordance with the project TMP;
- Ensuring that pedestrians and cyclists are considered in addition to general road users;
- Ensure Site Supervisors and workers are made aware of the TMP requirements related to their scope of work;
- Ensure regular inspections of all traffic management arrangements within the project;
- Ensure the delivery of the road safety and traffic management objectives outlined in the TMP;
- Ensure that adequate plant, equipment and human resources are made available for the installation and maintenance of temporary control devices; and
- Monitor the ongoing performance of traffic control operations across projects, conduct regular audits and identify and implement actions, as required, to enable continuous improvement.

### 5.2.3 Site Supervisors

Specific responsibilities of Site Supervisors include, but are not limited to (if there is no superintendent, site supervisor will manage the superintendent responsibilities):

- Reporting to their Superintendent;
- Consultation with the construction team regarding the day to day planning, operation and maintenance of the WTMPs;
- Management of traffic control;
- Ensuring all site personnel have the appropriate qualifications to carry out their duties;
- Ensuring site inductions for traffic management personnel have been completed prior to working on site;

- Ensuring WTMPs are executed in accordance with the agreed methodology, specification and statutory requirements;
- Responsibility for briefing all crew personnel about each WTMP, including TMC and/or relevant council Permit conditions, and then ensuring the correct implementation of the plan;
- Ensuring safe implementation of WTMPs and co-ordinate with the traffic management sub-contractor personnel;
- Ensuring daily inspection of ongoing implemented WTMPs to ensure that they are being appropriately maintained in accordance with relevant codes and standards. **Document with McConnell Dowell MMS Form Traffic Management Inspection Checklist (HSEQ-HS-FRM009-GEN-ALL);**
- Ensuring lane closures are carried out in line with the relevant WTMP and TMC and/or relevant council Approved Permits and are safe and efficient;
- Responsible for monitoring duration of work activities and compliance with time restrictions for working on public roads, (i.e. not starting too soon and ensuring traffic management is removed prior to specified times, for making the decision to 'go' / 'no go' with respect to continuation of works).
- Implementation of appropriate Variable Message Signage (VMS), as required, to advise road users and the public of change in conditions;
- Provision of a maintenance resource to ensure the traffic management scheme is maintained at all times including outside working hours; and

#### **5.2.4 Project Engineers (including Site Engineers)**

Project Engineers report to the Area Manager and communicate traffic management requirements to the broader team, including all staging and planning, in accordance with project requirements and this TMP. Specific responsibilities include, but are not limited to:

- Development of Construction Execution Procedures (CEPs) to ensure utmost consideration is given to providing a safe working environment for employees as well as addressing the safety of road users and the general public;
- Preparation of preliminary WTMPs in coordination with the traffic management sub-contractor;
- Ensuring advance WTMP preparation timeframe requirements are considered including the requirement to lodge permits with TMC five (5) days prior to intention to commence work on site;
- Ensuring after hours care is maintained for traffic management schemes where traffic management devices remain in place outside of work hours; and
- Maintaining the traffic management schemes during emergency response operations.

#### **5.2.5 Stakeholder and Communications Advisor**

The main objectives of the traffic communications strategies will be guided by the Community and Stakeholder Management Plan and relevant Project Community and Stakeholder Action Plan(s) and will focus on:

- Ensuring owners of the road asset (TMC/local councils) are well informed of any planned or unplanned changes to traffic via the TMP process, including the facilitation of permits as required;
- Ensuring liaison with public transport, freight, peak transport bodies, event organisers, business operations and tourism operators where traffic changes have an impact on specific road user segments;
- The provision of timely, accurate and comprehensive traffic and transport information to potentially affected road users and TMC;
- Influencing road users to abide by reduced speed limits or other restrictions, if any, through construction areas;
- Allowing and, where appropriate, accommodating community feedback regarding traffic and transport management issues;
- Ensuring media is well informed and providing advice to the travelling public of traffic changes associated with the project;
- In conjunction with relevant Local Government Authority(ies), setting up proactive measures to liaise, consult and communicate any information related to traffic management during the construction phase;



- Promoting safety education and awareness throughout the community and to vulnerable road users such as cyclists, children, elderly and those with a disability - where public safety has been identified as an issue via the relevant stakeholder engagement plan;
- Ensuring relevant emergency services are well-informed of planned and unplanned traffic changes and any incidents; and

Depending on the scale of the traffic management alteration, some or all of the following stakeholder communications and engagement methods will be employed prior to the implementation of Traffic Management Plans:

- Door knocking, email or telephone calls to all stakeholders directly affected by local traffic changes;
- Email updates to all stakeholders who register for traffic updates;
- Temporary VMS boards to provide advanced notification of works, lane closures, detours, etc;
- SMS updates to stakeholders registered for updates on major or unexpected traffic delays;
- Dissemination of Traffic Management Maps to the relevant Councils prior to their implementation;
- Advance notice static signage of upcoming changes to local access;
- Letterbox drop to local residents potentially affected by local changes to access or parking;

## 6. TRAFFIC MANAGEMENT PLAN

### 6.1 Traffic Management Plan (TMP)

The Traffic Management Plan identifies and defines the requirements, management processes, obligations and responsibilities for traffic management during the construction of the project in accordance with the project objectives and guidelines, AS 1742 Manual for Uniform Traffic Control Devices (MUTCD) and the requirements of relevant road authorities, standards, guidelines and other key stakeholders. The procedures and processes described in the TMP will ensure compliance with all statutory and project specific conditions as defined in the applicable codes, performance specifications and the contract are complied with during construction.

The TMP will define the overall traffic management arrangements, durations, impacts and mitigation strategies for a particular area and detail how traffic management activities will be carried out in a safe, compliant and efficient manner.

The TMP details the specific road safety and traffic management measures that will be applied by the SA Water Framework whilst undertaking the construction works. The TMP identifies the impacts resulting from the proposed work activities and describes the control measures that will be applied to address the impacts on the existing road network and local community. The TMP also includes the associated construction staging drawings. Compliance with all project requirements will be demonstrated in the TMP.

Key traffic documents include:

- Construction staging drawings;
- Workzone Traffic Management Plans (WTMPs) – medium and short-term arrangements (To be included within each relevant Construction Execution Procedure);
- Site construction layouts and access plans; and
- Specific plans will be developed for outputs that require additional information

In addition, there will be various associated documents including, but not limited to:

- Community and Stakeholder Management Plan; and
- Site specific stakeholder engagement plans.

All schemes are subject to approval before they are implemented. A description of each key traffic management process is detailed below in section 6.2.

### 6.2 Working Clearances, Barriers, Control Devices and Advanced Warning

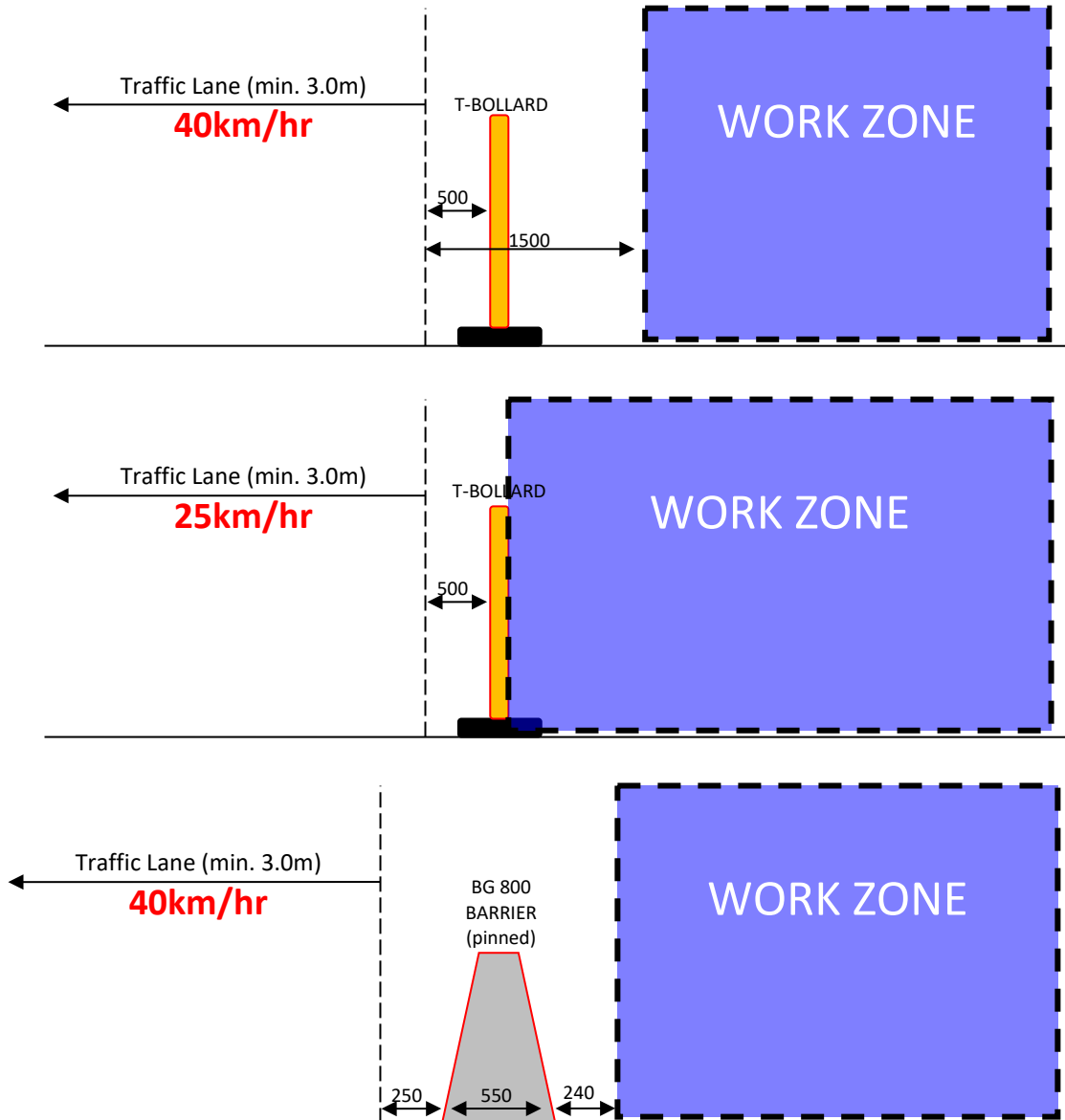
#### 6.2.1 Working Clearances and Barriers

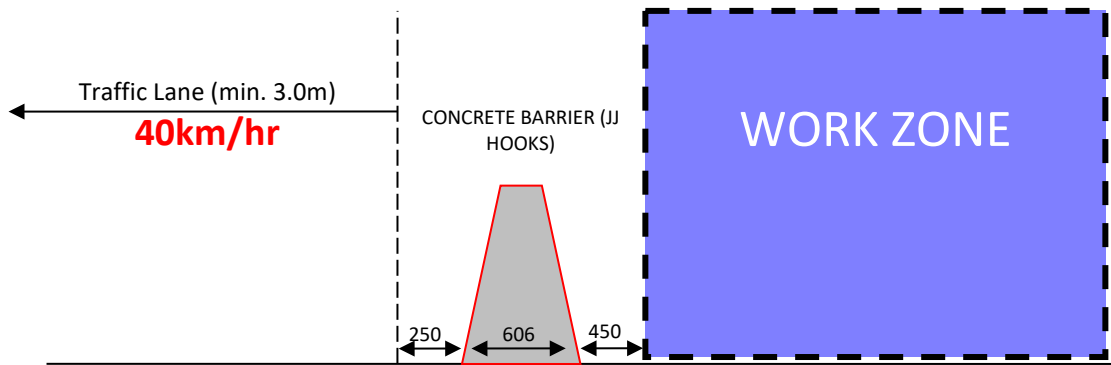


The safe working clearances shall be considered throughout the project. The use of temporary traffic barriers, T-bollards, cones and the like shall be chosen on the basis of safe working clearances.

All barriers shall be in accordance with Australian Standards and SA Standards for Workzone Traffic Management.

Below figures show typical site arrangements for working clearances in accordance with AS 1742.3, JJ Hooks Concrete Safety Barriers Installation and Maintenance Instructions, BarrierGuard 800 Product and Installation Manual (CSP Pacific May 2012), BarrierGuard 800 Literature Pack (Highway Centre Limited, 01-05-2009) and BG800 Installation manual January 2011 (Boylan).





**Figure 6-1: Typical Safe Work Clearances**

All workers shall be informed as part of the induction process and regular toolbox meetings of the working clearances allowable in relation to their work activities. A marked delineation may be used to indicate clearance distance from barriers for 25 km/h and 40 km/h speed zones.

### 6.2.2 Traffic Control Devices

All temporary traffic control devices shall meet legislation requirements and Australian Standards.

MDJV will engage reputable traffic control subcontractors with adequate experience to satisfy the requirements for traffic control devices.

Traffic control devices shall remain on the road network in non-working hours, as required and where approved, to ensure the safety of the road users adjacent the vacant work site.

### 6.2.3 Advanced Warning

If required as part of the project-specific stakeholder engagement plan, VMS boards will be installed prior to the start of the construction to provide advance warning to road users, remaining in place for a duration of time considered appropriate to local road user needs, guided by the relevant stakeholder engagement plan.

### 6.2.4 Site Layout, Access and Traffic

The project sites will require detailed plans for site mobilisation and layout, access gates, access roads, site walkways, light vehicle access, and all appropriate signage to meet MDJV management systems.

All site access requirements and updates shall be communicated within project specific inductions and regular toolbox meetings and daily pre-start meetings with the work crews.

Where sites result in restricted movement of vehicles and plant a site vehicle movement plan shall be prepared which may include details such as vehicle travel direction, speed and vehicle turning signage, entry/exit points, UHF channel information, parking areas, and pedestrian/traffic demarcation.

### 6.2.5 Worker Access

Workers' access shall be considered for all construction staging to ensure the safe access to sites. Pedestrian access will be clearly delineated (using green flagging) within site compounds where there is potential interaction between pedestrians and vehicles.

## 7. RECORDS

**Table 7-1: Records**

| Document Number        | Document Title     |
|------------------------|--------------------|
| COR-GNG-FRM001-GEN-GRP | Minutes of Meeting |

## 8. REFERENCES

All reference documents nominated shall be the latest revision or version

**Table 8-1: References**

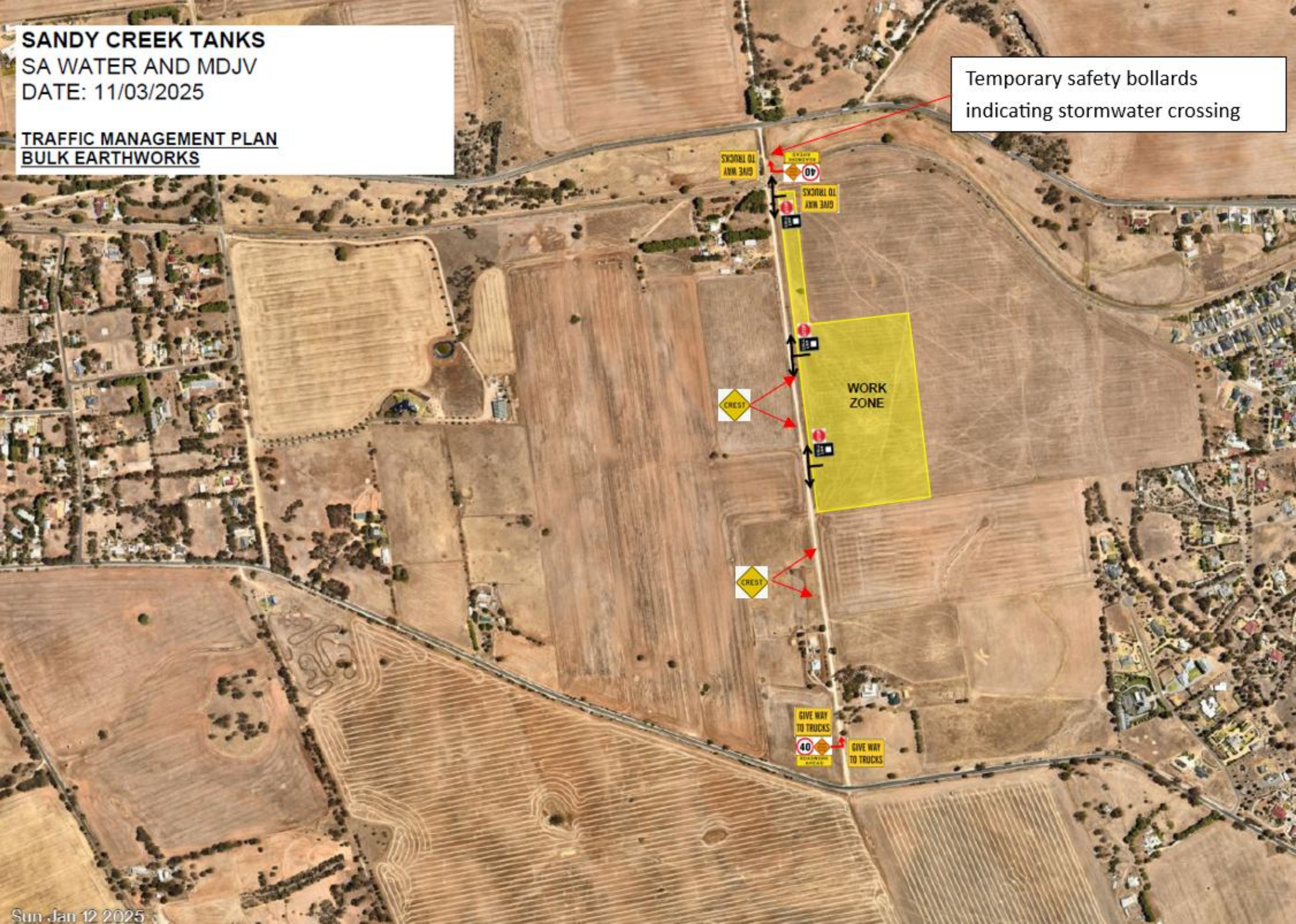
| <b>Document Number</b>   | <b>Document Title</b>                                                                 |
|--------------------------|---------------------------------------------------------------------------------------|
| HSEQ-SYS-PLN017-GEN-2910 | Project Management Plan                                                               |
| HSEQ-SYS-PLN001-GEN-2910 | Community and Stakeholder Management Plan                                             |
| HSEQ-SYS-PLN004-GEN-2910 | Construction Management Plan                                                          |
| HSEQ-SYS-PLN007-GEN-2910 | Engineering and Design Management Plan                                                |
| HSEQ-SYS-PLN013-GEN-2910 | Mobilisation Strategy                                                                 |
| AS 1742.3                | Manual for Uniform Traffic Control Devices (MUTCD) Traffic Control for Works on Roads |
| AS 4852                  | Variable Message Signs                                                                |
| Version 5                | SA Standards for Workzone Traffic Management                                          |



**SANDY CREEK TANKS**  
SA WATER AND MDJV  
DATE: 11/03/2025

**TRAFFIC MANAGEMENT PLAN**  
**BULK EARTHWORKS**

Temporary safety bollards  
indicating stormwater crossing







Nearmap

|                                                                                              |                                     |
|----------------------------------------------------------------------------------------------|-------------------------------------|
| <b>Client:</b> MDJV                                                                          | <b>Contact Number:</b> 0448 197 913 |
| <b>Contact:</b> Snehal Chakkara                                                              |                                     |
| <b>Job Location:</b> Kalperri Road, Sandy Creek                                              |                                     |
| <b>Local Government Authority:</b> Barossa                                                   |                                     |
| <b>Start Time:</b> 07:00 <b>Finish Time:</b> 17:00                                           |                                     |
| <b>State Managed Road:</b> No                                                                | <b>Bus Route:</b> No                |
| TGS drawn in conjunction with: AS 1742.3-2019, SA Standards Version 7.2 2023, AGTTM 1.0 2019 |                                     |
| PLAN SUBJECT TO CHANGE USE ROADWORKS APP TO LOG ONTO DIT MANAGED ROADWAY                     |                                     |

| <b>Designed By:</b> Vid Khun       |             |      |          |
|------------------------------------|-------------|------|----------|
| <b>Initial Release:</b> 07/08/2025 |             |      |          |
| Revision History                   |             |      |          |
| REV                                | Description | Date | Designer |
| A                                  |             |      |          |
| B                                  |             |      |          |
| C                                  |             |      |          |
| D                                  |             |      |          |



Disclaimer: This plan has been prepared as a guide for Traffic Management purposes. Zancott Traffic Group disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you might incur as a result of the information being inaccurate or incomplete in any way, and for any reason.



Legend

Work Area

Traffic Controller

Bus Path

Construction Vehicle Path

Pedestrian Path

Vehicle Path

Bollard



|                                                                                              |                              |                             |             |                                                                                       |                                                                                       |          |
|----------------------------------------------------------------------------------------------|------------------------------|-----------------------------|-------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------|
| Client: MDJV                                                                                 |                              | Designed By: Vid Khun       |             |  |  |          |
| Contact: Tim De Gennaro                                                                      | Contact Number: 0448 156 844 | Initial Release: 24/06/2025 |             |                                                                                       |                                                                                       |          |
| Job Location: Balmoral Road & Kalperri Road, Sandy Creek                                     |                              | Revision History            |             |                                                                                       |                                                                                       |          |
| Local Government Authority: Gawler                                                           |                              | REV                         | Description | Date                                                                                  |                                                                                       | Designer |
| Start Time: 07:00                                                                            | Finish Time: 17:00           | A                           |             |                                                                                       |                                                                                       |          |
| State Managed Road: No                                                                       |                              | B                           |             |                                                                                       |                                                                                       |          |
| Bus Route: No                                                                                |                              | C                           |             |                                                                                       |                                                                                       |          |
| TGS drawn in conjunction with: AS 1742.3-2019, SA Standards Version 7.2 2023, AGTMM 1.0 2019 |                              | D                           |             |                                                                                       |                                                                                       |          |
| PLAN SUBJECT TO CHANGE. WORK TIMES SUBJECT TO DIT / COUNCIL APPROVAL                         |                              |                             |             |                                                                                       |                                                                                       |          |

USE ROADWORKS APP TO LOG ONTO DIT MANAGED ROADWAY

SAPOL: 131 444

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# Stormwater Management Plan

## Sandy Creek Tanks

SA Water

17 April 2025

→ The Power of Commitment



| <b>Project name</b>   |          | Sandy Creek Tanks                              |             |           |                    |           |          |
|-----------------------|----------|------------------------------------------------|-------------|-----------|--------------------|-----------|----------|
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# Contents

|           |                                       |                              |
|-----------|---------------------------------------|------------------------------|
| <b>1.</b> | <b>Introduction</b>                   | <b>1</b>                     |
| 1.1       | Background                            | 1                            |
| 1.2       | Purpose of this report                | 1                            |
| 1.3       | Scope and limitations                 | 1                            |
| 1.3.1     | Scope                                 | 1                            |
| 1.3.2     | Limitations                           | 1                            |
| 1.4       | Assumptions                           | 2                            |
| 1.5       | Existing information                  | 2                            |
| <b>2.</b> | <b>Existing Site</b>                  | <b>3</b>                     |
| 2.1       | Site Location and Topography          | 3                            |
| 2.2       | External catchments                   | 5                            |
| 2.3       | Land use                              | 6                            |
| 2.4       | Geology and soils                     | 7                            |
| <b>3.</b> | <b>Climate and hydrology</b>          | <b>8</b>                     |
| 3.1       | Rainfall                              | 8                            |
| 3.2       | Temperatures and evaporation          | 10                           |
| 3.3       | Design rainfalls                      | 10                           |
| 3.4       | Climate change impacts                | 11                           |
| 3.5       | Flood Modelling                       | 12                           |
| 3.6       | Surface water and Groundwater         | 12                           |
| <b>4.</b> | <b>Stormwater management strategy</b> | <b>13</b>                    |
| 4.1       | Design requirements                   | 13                           |
| 4.1.1     | Tanks overflow event                  | Error! Bookmark not defined. |
| 4.2       | Modelling                             | 13                           |
| 4.2.1     | Hydrological Analysis                 | 13                           |
| 4.2.2     | Hydraulic Analysis                    | 14                           |
| 4.2.2.1   | Initial conditions                    | 14                           |
| 4.2.2.2   | Surface roughness                     | 14                           |
| 4.2.2.3   | Basin Infiltration rates              | 15                           |
| 4.2.2.4   | Limitations of the modelling          | 15                           |
| 4.3       | Strategy layout                       | 15                           |
| 4.4       | Analysis outcomes                     | 17                           |
| 4.4.1     | Pre-development scenario              | 17                           |
| 4.4.2     | Post-development scenario             | 17                           |
| 4.4.2.1   | Stormwater Storage                    | 18                           |
| 4.5.2     | Treatment train layouts               | 19                           |
| <b>5.</b> | <b>Maintenance</b>                    | <b>22</b>                    |
| <b>6.</b> | <b>Construction phase</b>             | <b>23</b>                    |
| <b>7.</b> | <b>Conclusion</b>                     | <b>24</b>                    |

## Table index

|          |                                                                                               |    |
|----------|-----------------------------------------------------------------------------------------------|----|
| Table 1  | Annual mean rainfall statistics near Site                                                     | 8  |
| Table 2  | IFD design rainfall intensities (mm/hr)                                                       | 10 |
| Table 3  | IFD design rainfall intensities adjusted for climate change (mm/hr)                           | 12 |
| Table 4  | Design criteria table                                                                         | 13 |
| Table 5  | DRAINS ISLAX hydrological model parameters                                                    | 14 |
| Table 6  | Manning's n roughness coefficients, Sourced: AUSTROADS guide to road design part 5, Table 2.1 | 14 |
| Table 7  | Site Area                                                                                     | 17 |
| Table 8  | Pre-development catchment characteristics                                                     | 17 |
| Table 9  | Pre-development flow rates generated from the site for current and future conditions.         | 17 |
| Table 10 | Post-development catchment characteristics                                                    | 17 |
| Table 11 | Post-development flow rates generated from the Site under current condition                   | 18 |
| Table 15 | Sites pollutant reduction targets                                                             | 19 |
| Table 12 | MUSIC model results                                                                           | 21 |

## Figure index

|           |                                                                                                           |    |
|-----------|-----------------------------------------------------------------------------------------------------------|----|
| Figure 1  | Topographical map of the site, sandy creeks tank site location (green polygon), Sourced: Location SA 2024 | 3  |
| Figure 2  | Aerial photos of the site, sandy creeks tank site location (green polygon), Sourced: Location SA 2024     | 4  |
| Figure 3  | Water courses around the site. Starred: approximent site location. . source: LocationSA 2024.             | 5  |
| Figure 4  | 'Land Use Generalised 2022' for the Site, Source LocationSA. Starred: Site location                       | 6  |
| Figure 5  | Geological information of the Site, Starred: proposed location. Source: SARIG.                            | 7  |
| Figure 6  | Geological rock information of the site, Starred: proposed site location. Source: PIRSA geological maps.  | 7  |
| Figure 7  | Mean Monthly Rainfall                                                                                     | 9  |
| Figure 8  | Sandy Creek Mean Monthly Temperatures and Evaporation Sourced: Parafield Airport (BOM)                    | 10 |
| Figure 9  | IFD climate change multiplier for SSP 4.5 and 8.5 pathways as a function of storm duration                | 11 |
| Figure 10 | Proposed Stormwater Management Strategy                                                                   | 16 |
| Figure 11 | Detention basin volume for a 5% AEP event under current conditions and future conditions                  | 18 |
| Figure 12 | MUSIC model for the Sandy Creek site.                                                                     | 20 |

# 1. Introduction

## 1.1 Background

This Stormwater Management Plan outlines a comprehensive approach to managing stormwater at the proposed Sandy Creek Tanks site, focusing on runoff reduction, treatment, and erosion control. By integrating sustainable practices and experience, the plan aims to mitigate the environmental impact of stormwater, ensure governing compliance, and safeguard the long-term operation of the proposed facilities.

The sections detailed in this report address the site-specific assessments, stormwater management strategies, and implementation plans necessary to achieve these objectives. Through this plan, the commitment is to promote environmental protection, management of flows onsite and contribute to the sustainable development of SA Water infrastructure.

## 1.2 Purpose of this report

The purpose of this report is to provide a framework for the management of stormwater at the Sandy Creek Tanks facility. This framework is designed to address the unique challenges posed by stormwater runoff in the context of the Project site and to allow for improved environmental protection and regulatory compliance.

## 1.3 Scope and limitations

### 1.3.1 Scope

GHD's scope involved a background review of potential surface water, stormwater and groundwater receptors relative to the Site, and to subsequently prepare a Stormwater Management Plan. Key activities for this assessment include:

- Undertaking a desktop review of the Site's position relative to the topography, hydrology and surrounding catchments
  - This included a desktop review of potential impacts to water quality, erosion and sedimentation during the construction and operational phase of the tanks, as well as measures to avoid and/or mitigate impacts to water quality
- Review of background information from sources noted in Section 1.5.
- Identify key Site stormwater infrastructure required to meet requirements and suit the development
- Prepare a DRAINS stormwater model to undertake a high-level hydraulic analysis of key stormwater infrastructure

### 1.3.2 Limitations

This report has been prepared by GHD for SA Water and may only be used and relied on by SA Water for the purpose agreed between GHD and SA Water as set out in this report.

GHD otherwise disclaims responsibility to any person other than SA Water arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.



## 1.4 Assumptions

Any assumptions made at a more detailed level are outlined in the relevant sections of this report.

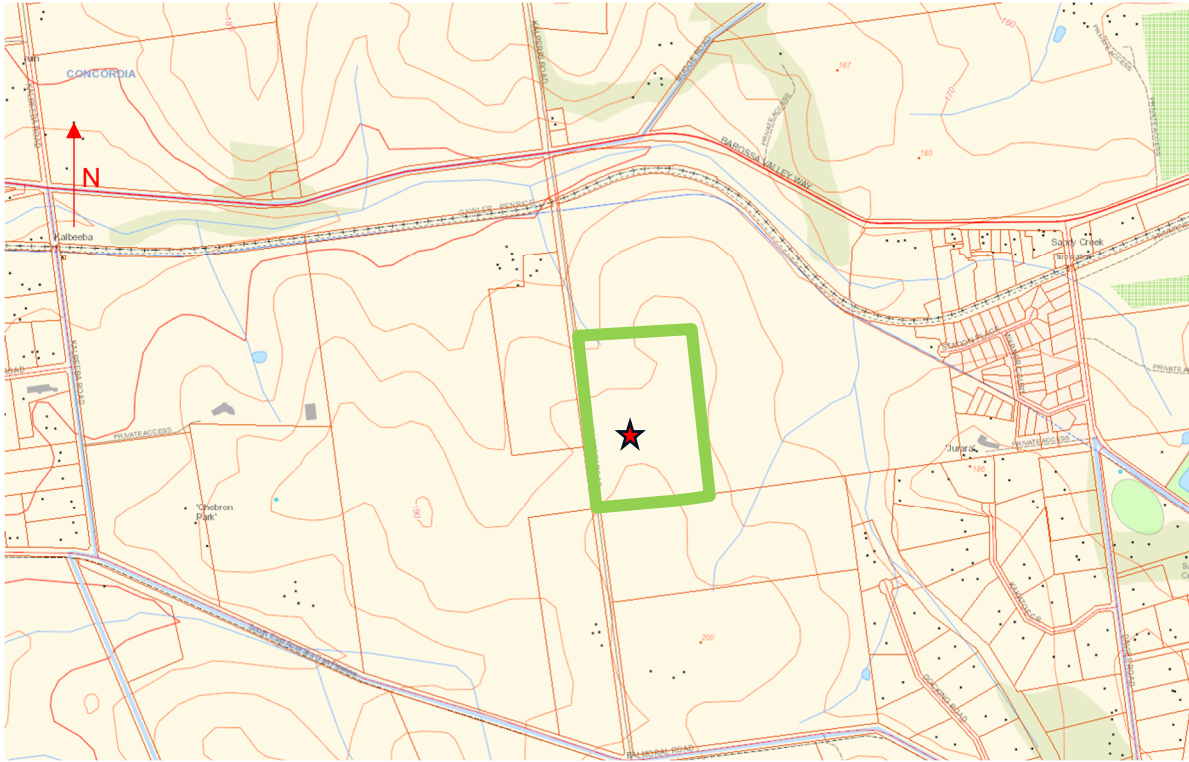
## 1.5 Existing information

- The Barossa Council – Standards and Requirements for the Design, Construction and Development of Infrastructure Assets – Guidelines for undertaking Land Division (2022)
- LocationSA Map Viewer
- South Australian Resources Information Gateway (SARIG)
- WaterConnect
- Water Data SA
- Bureau of Meteorology, Commonwealth of Australia 2024
- Concept design drawings and concept report provided by SA Water
  - Concept Report: A0014-0109-MUL-CDR-001
  - SA42252-06-00001\_01
  - Sandy Creek Landscape Concept Design
  - A0014-0109-Barossa System Growth -Sandy Creek PRT/PRV (Sandy Creek Tanks)- Geotechnical Interpretative Report (A0014-0109-GE-REP-02)
- ARR Data Hub 2024 (<https://data.arr-software.org/>)
- AUSTROADS Guide to Road Design Part 5A, Drainages: Road Surface, Networks, Basin and Subsurface.

## 2. Existing Site

### 2.1 Site Location and Topography

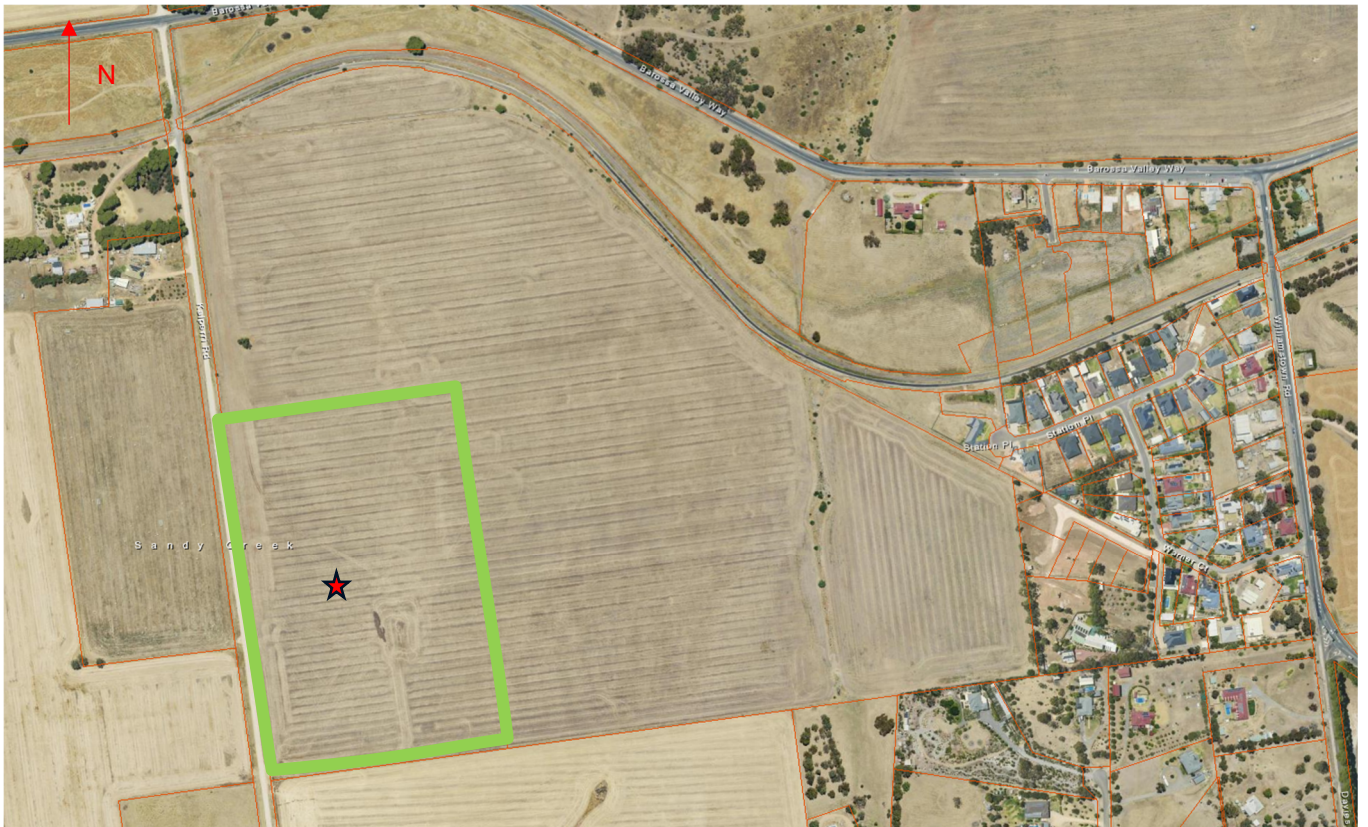
The Sandy Creeks Tanks Project Site is located approximately 6.5 kilometres (km) east of Gawler and approximately 43 km from Adelaide. It is accessible from Kalperri Road on the Western boundary of the Site, see Figure 1



**Figure 1** Topographical map of the site, sandy creeks tank site location (green polygon), Sourced: Location SA 2024

No available LIDAR terrain and topographic data is available as the Site. However, limited contour data is available on LocationSA MapViewer, indicates that the site straddles a ridge line with approximately half the site terrain grading northwest towards Kalperri Rd and the other half of the site grading northeast towards a watercourse (Figure 1).

Aerial imagery of the proposed site suggests there is no existing formal site drainage or water courses, and it is expected that some of the runoff would sheet flow across from the upstream external catchments from the south through the Site, following the natural topography to the north into Kalperri Rd. Aerial Imagery of the site can be seen in Figure 3.

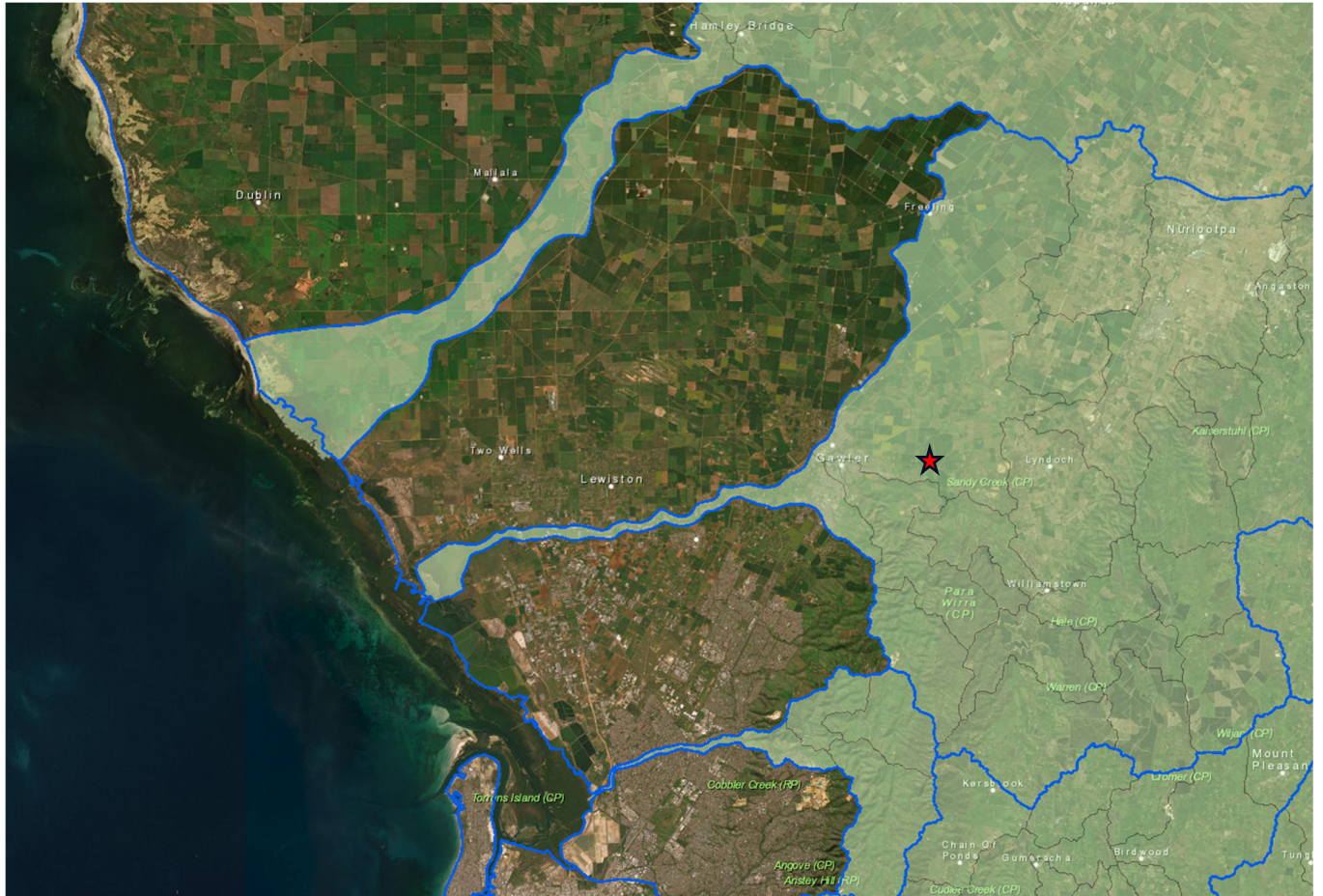


**Figure 2**      **Aerial photos of the site, sandy creeks tank site location (green polygon), Sourced: Location SA 2024**



## 2.2 External catchments

The major external catchments do not appear to directly impact the Site with the nearest concentration of flows to be Sandy Creek watercourse. Sandy Creek is a tributary to the North Para River which in turn is a tributary of the Gawler River that discharges into the Gulf of St Vincent. Sandy Creek passes along the Barossa Valley Way and continues to the west of the Site, as Sandy Creek is a tributary stream at the top of the North Para River catchment it would highly unlikely that a flood event along the North Para River would affect the site (Figure 3).

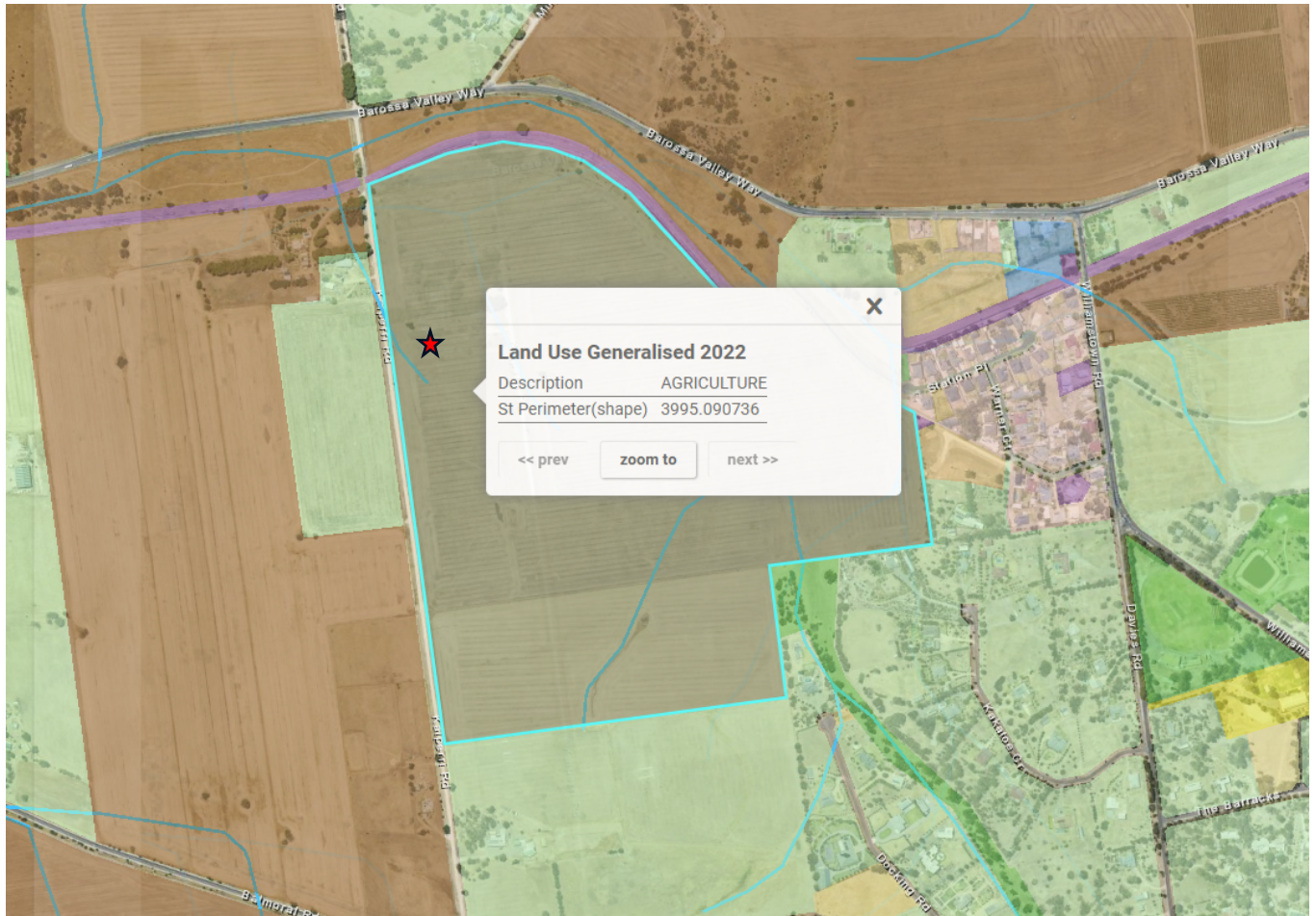


**Figure 3** Water courses around the site. Starred: approximant site location. . source: LocationSA 2024.



## 2.3 Land use

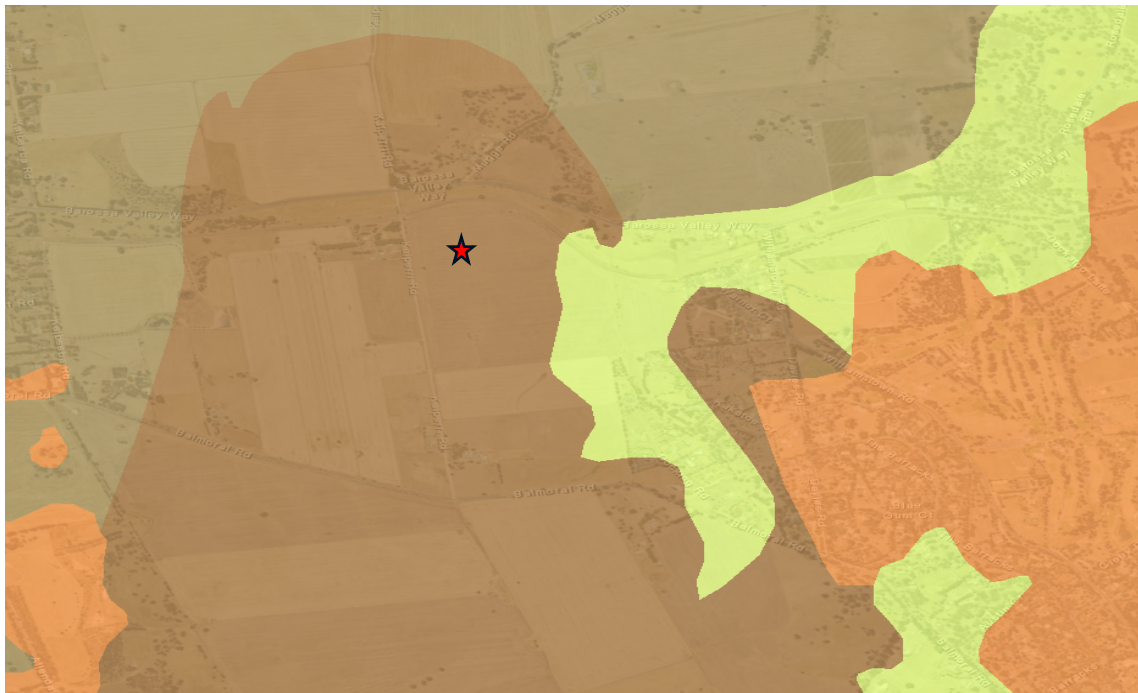
The current land use for the Site is identified as Agriculture as identified from LocationSA (Figure 4). However, in the future the zoned land use may be subject to change as residential development in the surrounding area occurs but for the purpose of this report the project site land use will be assessed as industrial for council stormwater requirements.



**Figure 4** 'Land Use Generalised 2022' for the Site, Source LocationSA. Starred: Site location

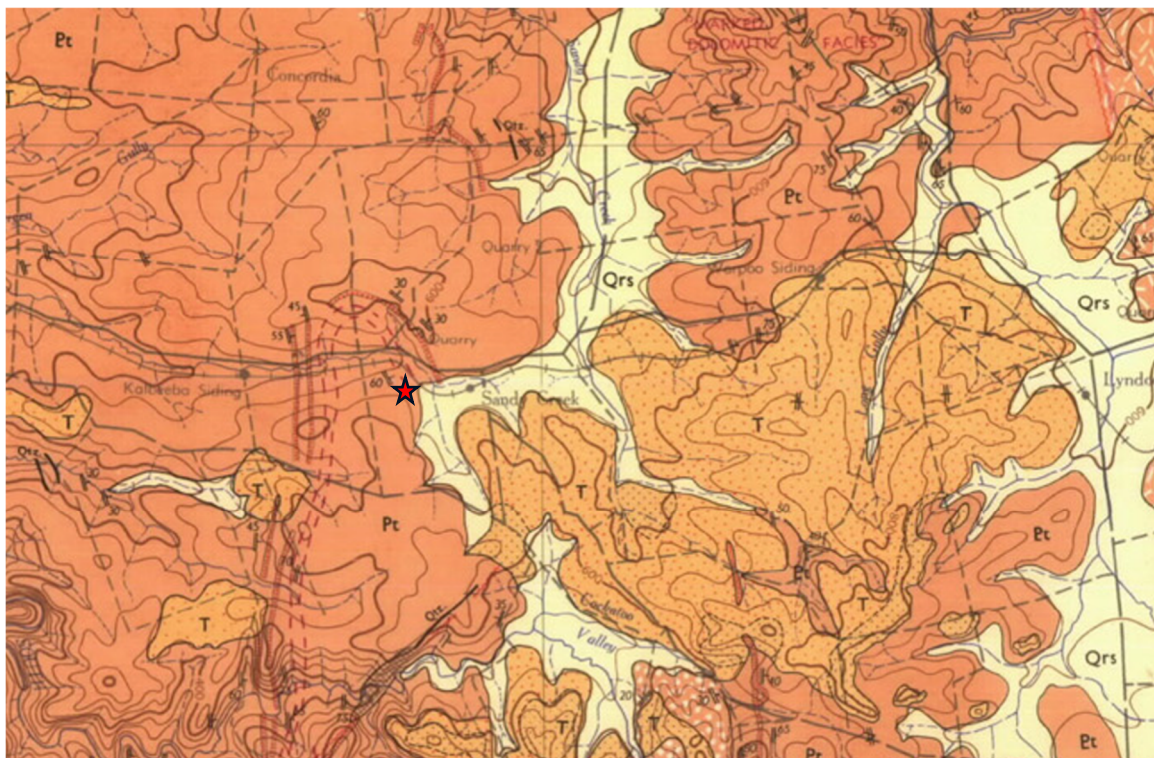
## 2.4 Geology and soils

The South Australian Resources Information Gateway (SARIG) website developed by the Department for Energy and Mining was used to source the stratigraphic and geological information of the site and surrounding areas see Figure 5. It was noted that the site is mainly situated on the Castambul Formation and has loam clay soils.



**Figure 5** Geological information of the Site, Starred: proposed location. Source: SARIG.

Additionally, PIRSA geological maps (see Figure 6) show that the site may rest on a slaty dolomitic rock beds. This indicates that the site may have substantial rock beds present which would impact the infiltration rates of a detention basin therefore a conservative infiltration rate will be chosen when modelling the drainage design.



**Figure 6** Geological rock information of the site, Starred: proposed site location. Source: PIRSA geological maps.



## 3. Climate and hydrology

### 3.1 Rainfall

The closest rainfall gauges from the Bureau of Meteorology (BOM) climate data online for Sandy Creek has varying dates of operation and locations within the Gawler and Barossa regions. These include:

- 023309 Lyndoch: Open, 1887 – Current
- 023107 Gawler: Open, 2004 – Current
- 023078 Gawler Council Depot: Closed, 1861 – 2018
- 023752 Williamstown: Open, 1880 - Current

The mean annual rainfall in Sandy Creek from the stations above is 522.475 mm.

The Bureau of Meteorology statistical analysis of the annual rainfall variation reports the annual mean as summarised in Table 1. This shows the monthly deviations from the annual mean and illustrate monthly trends.

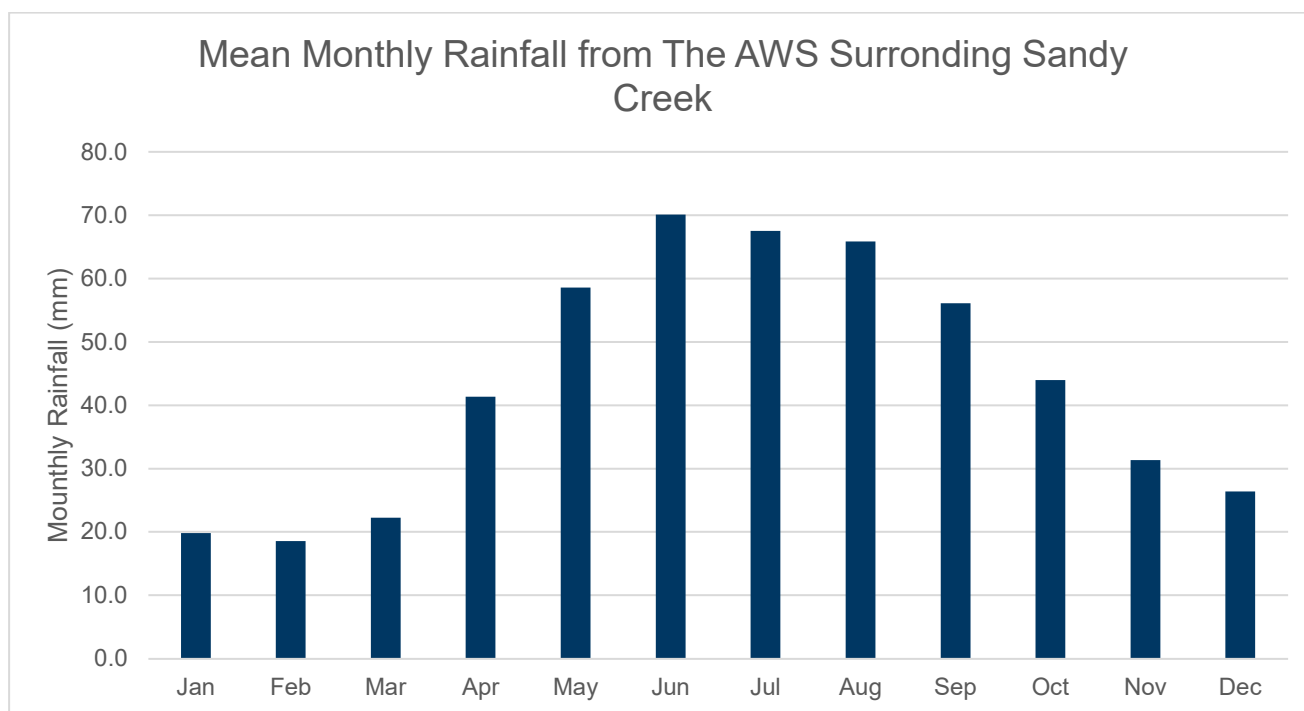
**Table 1** Annual mean rainfall statistics near Site

| Statistic                          | Annual rainfall (mm) | % Difference to mean |
|------------------------------------|----------------------|----------------------|
| <b>023309 Lyndoch</b>              |                      |                      |
| Mean                               | 559.0                | -                    |
| Lowest (1967)                      | 292.0                | 47.76%               |
| 10th Percentile                    | 393.3                | 29.64%               |
| Median                             | 565.2                | 1.11%                |
| 90th Percentile                    | 733.1                | 31.14%               |
| Highest (1923)                     | 1035.3               | 85.21%               |
| <b>023107 Gawler</b>               |                      |                      |
| Mean                               | 381.4                | -                    |
| Lowest (2019)                      | 239.0                | 37.34%               |
| 10th Percentile                    | 276.2                | 27.58%               |
| Median                             | 392.2                | 2.83%                |
| 90th Percentile                    | 493.9                | 29.50%               |
| Highest (2016)                     | 540.6                | 41.74%               |
| <b>023078 Gawler Council Depot</b> |                      |                      |
| Mean                               | 471.6                | -                    |
| Lowest (1976)                      | 258.0                | 45.29%               |
| 10th Percentile                    | 336.7                | 28.60%               |
| Median                             | 460.2                | 2.42%                |
| 90th Percentile                    | 613.1                | 30.00%               |
| Highest (1889)                     | 779.9                | 65.37%               |
| <b>023752 Williamstown</b>         |                      |                      |
| Mean                               | 677.9                | -                    |



|                        |        |        |
|------------------------|--------|--------|
| <b>Lowest (1914)</b>   | 310.5  | 54.20% |
| <b>10th Percentile</b> | 490.1  | 27.70% |
| <b>Median</b>          | 669.0  | 1.31%  |
| <b>90th Percentile</b> | 902.4  | 33.12% |
| <b>Highest (1992)</b>  | 1194.8 | 76.25% |

Figure 7 shows the mean monthly rainfall, which indicates the driest month to be February and the wettest, June. July and August have also historically shown high monthly rainfall similar to June.



**Figure 7**      *Mean Monthly Rainfall*

## 3.2 Temperatures and evaporation

The evaporation, maximum, and minimum mean monthly temperatures from Sandy Creek was sourced from the Roseworthy BOM weather station as there is significant distance between the site and weather station the data was crossed checked with Australian wide average number which found that evaporation trends was broadly consistent. The data reveals that the evaporation and temperatures are trend with the varying monthly temperatures.

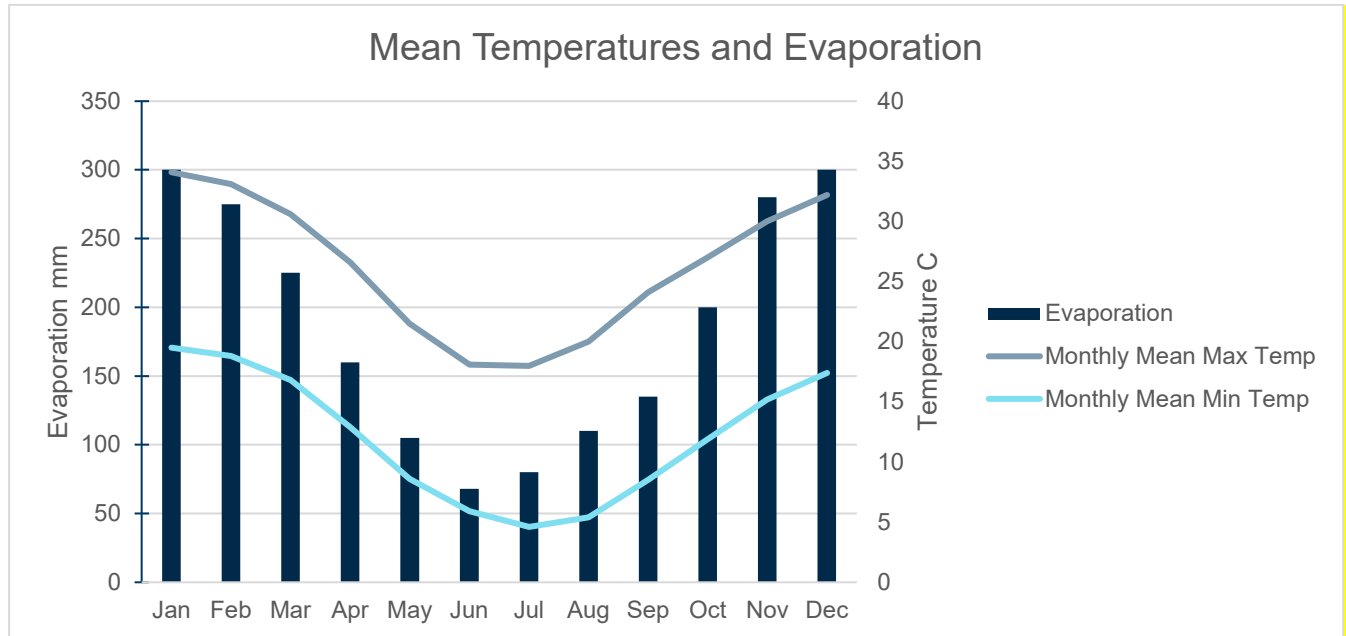


Figure 8 Sandy Creek Mean Monthly Temperatures and Evaporation Sourced: Parafield Airport (BOM)

## 3.3 Design rainfalls

Design rainfall Intensity-Frequency-Duration (IFD) has been sourced from the BOM utilising the Australian Rainfall and Runoff 2019 online procedure. Design rainfall is based on the Sites coordinates:

- Latitude: -34.606
- Longitude: 138.814

Table 2 IFD design rainfall intensities (mm/hr)

| Duration | Annual Exceedance Probability (AEP) |      |      |      |      |      |      |
|----------|-------------------------------------|------|------|------|------|------|------|
|          | 63.20%                              | 50%# | 20%* | 10%  | 5%   | 2%   | 1%   |
| 5 min    | 47.9                                | 54.6 | 77.4 | 94.5 | 113  | 139  | 161  |
| 10 min   | 34.9                                | 39.8 | 56.5 | 69.2 | 82.6 | 102  | 119  |
| 20 min   | 23.9                                | 27.3 | 38.7 | 47.4 | 56.6 | 70.0 | 81.2 |
| 30 min   | 18.8                                | 21.4 | 30.4 | 37.1 | 44.2 | 54.6 | 63.4 |
| 45 min   | 14.6                                | 16.6 | 23.5 | 28.7 | 34.2 | 42.1 | 48.8 |
| 1 hour   | 12.2                                | 13.8 | 19.5 | 23.8 | 28.3 | 34.8 | 40.3 |
| 3 hour   | 5.90                                | 6.68 | 9.35 | 11.4 | 13.5 | 16.6 | 19.2 |
| 6 hour   | 3.72                                | 4.20 | 5.84 | 7.08 | 8.41 | 10.4 | 12.0 |
| 12 hour  | 2.34                                | 2.63 | 3.63 | 4.40 | 5.21 | 6.43 | 7.47 |

Note:

# The 50% AEP IFD does not correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.

\* The 20% AEP IFD does not correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

### 3.4 Climate change impacts

The DEW note that South Australia's climate is undergoing changes to typical weather patterns, including temperature and rainfall. These shifts have resulted in longer, hotter, and more frequent heatwaves, an increase in dangerous fire weather, intensified heavy rain events, and rising sea levels along the coast (DEW, 2022). Potential future changes in rainfall patterns are of particular concern for stormwater management as they affect flood protection levels, stormwater drainage performance, and the availability of stormwater for harvesting and reuse.

The approach to modelling climate change for the site has been developed with reference the methodology outlined in ARR 2019, and the *Guide to Climate Projections for Risk Assessment and Planning in South Australia 2022* (DEW, 2022). ARR 2019 recommends the use of SSPs 4.5 and 8.5 (medium and high concentration pathways, respectively) for rainfall intensity impact assessment.

To understand the potential impacts of climate change on the site hydrology, the design life of the project is to be considered and the level of risk posed by climate change before selecting an appropriate SSP pathway. For this water infrastructure, an expected 50-100 year life cycle of new infrastructure makes it medium to long term project there for a climate change projection year of 2090 can be applied for drainage management strategies.

With the site falls within the Southern and South-Western Flatlands sub-cluster, the resulting climate change factors were accessed from the ARR Data Hub for Sandy Creek (project year 2050) and are displayed in Figure 9 as a function of storm duration.

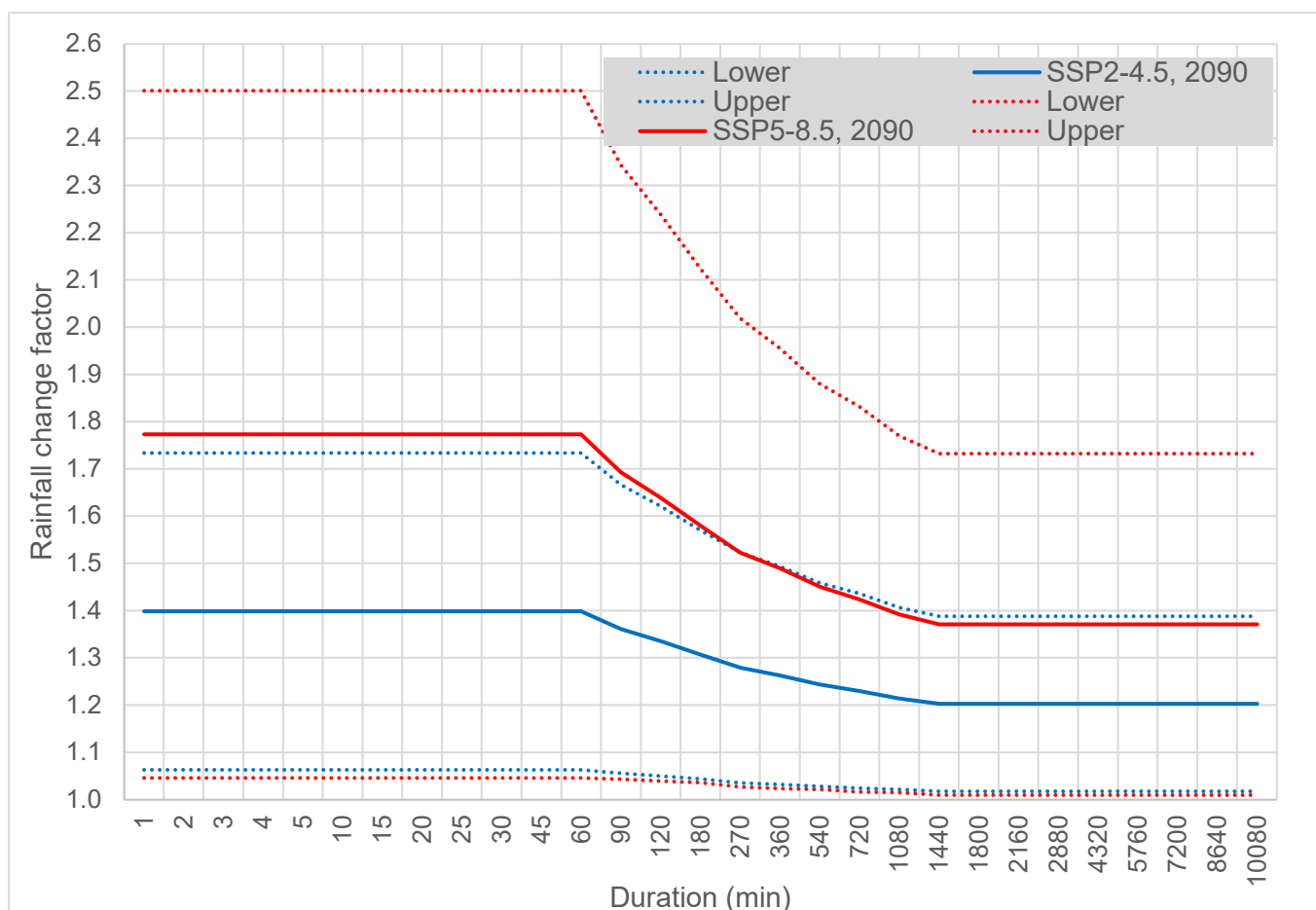


Figure 9 IFD climate change multiplier for SSP 4.5 and 8.5 pathways as a function of storm duration

DEW 2022 also states that observed temperature changes in Australia have been tracking towards the upper end of the range of temperature change projected in model simulations that include the currently observed conditions of greenhouse gases.

Given the flood risks for concrete tanks are lows and expected life cycle of the water infrastructure, SSP 4.5 (medium emissions) will be adopted to align with the current scenario. Therefore, the Intensity-Frequency-Duration



data shown in the Table 2 will have an increased climate change factor applied as displayed in Table 3. The modelling of the proposed of drainage design will also utilise these rainfall intensities to ensure the system adapt to climate change.

**Table 3** *IFD design rainfall intensities adjusted for climate change (mm/hr)*

| Duration | Annual Exceedance Probability (AEP) |       |        |        |        |        |        |
|----------|-------------------------------------|-------|--------|--------|--------|--------|--------|
|          | 63.20%                              | 50%#  | 20%*   | 10%    | 5%     | 2%     | 1%     |
| 5 min    | 67.06                               | 76.44 | 108.36 | 132.30 | 158.20 | 194.60 | 225.40 |
| 10 min   | 48.86                               | 55.72 | 79.10  | 96.88  | 115.64 | 142.80 | 166.60 |
| 20 min   | 33.46                               | 38.22 | 54.18  | 66.36  | 79.24  | 98.00  | 113.68 |
| 30 min   | 26.32                               | 29.96 | 42.56  | 51.94  | 61.88  | 76.44  | 88.76  |
| 45 min   | 20.44                               | 23.24 | 32.90  | 40.18  | 47.88  | 58.94  | 68.32  |
| 1 hour   | 17.08                               | 19.32 | 27.30  | 33.32  | 39.62  | 48.72  | 56.42  |
| 3 hour   | 7.73                                | 8.75  | 12.25  | 14.93  | 17.69  | 21.75  | 25.15  |
| 6 hour   | 4.69                                | 5.29  | 7.36   | 8.92   | 10.60  | 13.10  | 15.12  |
| 12 hour  | 2.88                                | 3.23  | 4.46   | 5.41   | 6.41   | 7.91   | 9.19   |

DEW 2022 also shows for Northern and Yorke Peninsula Area (in which Sandy Creek is a part of) that the annual rainfall is expected to decrease. 2050 projections for Sandy Creek RCP scenarios 4.5 and 8.5 are expected to be:

- SSP 4.5: -12.4% (decrease) change in projected annual rainfall
- SSP 8.5: -11.4% (decrease) change in projected annual rainfall

Adopting the 4.5 SSP pathway, the proposed annual rainfall reduction will impact the stormwater harvest yields and water quality modelling for the Tanks. The impact of climate change for soil moisture for the Site is not clear but it is expected that the soil moisture will decrease as temperatures increase.

## 3.5 Flood Modelling

No flood modelling has been modelled for this work and a review of current flood maps available on the Barossa council website reveal no flood maps that include the project area.

## 3.6 Surface water and Groundwater

A SA water geotechnical investigation (A0014-0109-GEO-REP-002) were made available for identifying relations between surface water and ground water for the site. Analysis of the borehole information from the report indicate a variety of Standing Water Level (SWL) depth near the site, with a SWL depths ranging from 10m to 20m below the surface. Higher moisture content was found in the soil nearer to the creek bed to the north of the site and some season variation is expected in the groundwater SWL due to changing rainfall patterns. Due to the SWL being significantly below the surface level, little to no interaction between surface water and groundwater is expected.

## 4. Stormwater management strategy

### 4.1 Design requirements

Barossa Council has provided stormwater requirements for industrial land developments. The following requirements are shown in Table 4

Table 4 Design criteria table

| Attribute                                  | Description                                                                                                                                                                                                                                                             | Reference                                                                                                                          |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Design storm events (site drainage)</b> | Internal Drainage system to handle a 10% AEP<br>*Minor system: 10% AEP (discharge to council's system)<br>*Major system: 1% AEP (discharge to council's system)<br>^Internal site drainage: 10% AEP<br>^Buildings gutters/eaves: 5% AEP<br>^Box gutters/valleys: 1% AEP | SA Water Project Design Requirements<br>*The Barossa Council Guidelines for Undertaking Land Divisions 2021<br>^AS/NZS 3500.3:2021 |
| <b>Detention</b>                           | Detention shall be provided to limit the 5% AEP post – development peak discharge to the 5% AEP pre-development peak discharge from the site or the Maximum discharge outlined below. Whichever is the lesser.                                                          | The Barossa Council Guidelines for Undertaking Land Divisions 2021                                                                 |
| <b>Discharge</b>                           | 12L/s for a 10% AEP or 20 L/s for a 1% AEP. *                                                                                                                                                                                                                           | The Barossa Council Guidelines for Undertaking Land Divisions 2021                                                                 |
| <b>Water Quality</b>                       | ^Water quality to be treated under current best practice<br>80% reduction in Total Suspended Solids<br>60% reduction in Total Phosphorous<br>45% reduction in Total Nitrogen<br>90% reduction in Gross Pollutants.                                                      | ^The Barossa Council Guidelines for Undertaking Land Divisions Council 2021<br>Water sensitive SA Guidelines                       |
| <b>Climate Change Multiplier</b>           | See Figure 9                                                                                                                                                                                                                                                            | Based on ARR 2019, Book 1, Chapter 6                                                                                               |
| <b>Channel Slope</b>                       | Minimum 0.25% (hard lined)<br>Minimum 0.5% (vegetated/bare earth)<br>Batter slopes 1:3 if rock lined or 1:6 if grassed lined<br>^No Scour - Grassed Lined minimum                                                                                                       | Austroroads Part 5B: Drainage, 2.7<br>^The Barossa Council Guidelines for Undertaking Land Divisions 2021                          |

\*This standard relates to small residential lots and as such is unlikely to be met given the size of the catchment area.

### 4.2 Modelling

#### 4.2.1 Hydrological Analysis

The drainage modelling software DRAINS was used to analyse the pre and post development stormwater flows, understand limitations, identify the extent of additional infrastructure required, and to determine preliminary storage volumes required to meet the nominated discharge flow rate from the site.

The model was developed using the design parameters from site-specific input data and assumptions based on the survey information obtained.

As identified, the Site has been classified as loam over clay on rock and is expected to have good infiltration. This type of soil is known to have a lower runoff potential. Based on this assessment, the catchment parameters listed in Table 5 were adopted for the ILSAX hydrological model in DRAINS.

**Table 5** *DRAINS ILSAX hydrological model parameters*

| Parameter                                  | Value |
|--------------------------------------------|-------|
| Impervious Area Depression Storage (mm)    | 1     |
| Supplementary Area Depression Storage (mm) | 1     |
| Pervious Area Depression Storage (mm)      | 10    |
| Soil Type                                  | 4     |

The modelling within DRAINS was undertaken in accordance with the procedures recommended in Australian Rainfall and Runoff (ARR) 2019. Rainfall intensity data and temporal patterns were obtained from the Bureau of Meteorology website and the ARR Data Hub and are based on 2016 Intensity Frequency Duration (IFD) rainfalls.

## 4.2.2 Hydraulic Analysis

The one-dimensional (1D) hydraulic model of the Site's catchment was undertaken using the software program DRAINS. The minor design storm events will have also be simulated with SSP 4.5 climate change factors applied to ensure that the drainage is suitable for future conditions.

The hydraulic model was run to simulate the following design storm events:

- Major event (overland flow drainage) - 1% Annual Exceedance Probability (AEP) (1 in 100 year Average Recurrence Interval (ARI))
- Minor Event (storage/basin discharge) – 5% Annual Exceedance Probability (AEP) (1 in 20 year Average Recurrence Interval (ARI)) + Climate Change
- Minor Event (internal underground drainage) – 10% Annual Exceedance Probability (AEP) (1 in 10 year ARI) + Climate Change

### 4.2.2.1 Initial conditions

Open channels and basins within the Site model were assumed to be 'dry' before the onset of the design storm events. Consequently, no initial conditions were applied. This meant the stormwater systems were free to discharge to atmosphere and all detention basins were initially modelled as empty.

### 4.2.2.2 Surface roughness

As with all hydraulic models, the roughness of the various surfaces which convey flow (surface and piped) will impact on the flow rates and velocities arriving at each point of interest (e.g. pits, basins etc.). Areas which are relatively smooth such as paved surfaces have low Manning's n values. Conversely, unsealed surfaces such as gravel and natural earth which are 'rougher' have higher Manning's n coefficients. The Manning's n roughness coefficients used within the model are listed in Table 6

**Table 6** *Manning's n roughness coefficients, Sourced: AUSTRROADS guide to road design part 5, Table 2.1*

| Surface type      | Manning's n |
|-------------------|-------------|
| Asphalt           | 0.014       |
| Gravel            | 0.020       |
| Concrete pipes    | 0.013       |
| Concrete surfaces | 0.013       |
| Riprap            | 0.030       |

| Surface type                                   | Manning's n |
|------------------------------------------------|-------------|
| Sparse vegetation (pre-development conditions) | 0.035       |

#### 4.2.2.3 Basin Infiltration rates

The Site's detention basin will be assumed pervious and dry at the onset of a storm considering the yearly rain is relatively low. An unlined basin will allow for natural infiltration and water quality benefits. Losses have been allowed for the detention basin within the DRAINS model. If there is a contamination risk from pollutant on site the basin can be lined but this would remove water quality benefits.

#### 4.2.2.4 Limitations of the modelling

While care has been taken in the preparation of the model and the choice of the adopted parameter values, all hydrological and hydraulic modelling has an inherent level of uncertainty.

This is due to several factors, including the following:

- The analysis to date has been undertaken at a conceptual level. Further refinements to the design will occur during the detailed design phase which may result in different storage volumes.
- Estimation of input parameters for the model such as Manning's roughness, entry and exit losses, and time of concentration
- Dynamic changes to topography due to erosion or deposition of soils during a flood event, which can lead to changes in the distribution of site flows. These processes have not been included in the model.
- Uncertainty in the rainfall pattern and catchment conditions prior to a flood. Actual flood events are dependent on antecedent moisture conditions prior to rainfall, initial detention storage levels at the beginning of rainfall runoff and the intensity and uniformity of the rainfall event within the analysis area. The floods modelled in this assessment are based on design storm bursts which attempt to reproduce the expected average temporal pattern of a storm burst within specified rainfall zones. As such, individual rainfall events may exhibit a differing temporal pattern that those modelled.

### 4.3 Strategy layout

A layout of the proposed stormwater management strategy for the Site is given in Figure 10.

The figure highlights the major overland flow paths, detention storage, stormwater quality management and general flow management.

The general stormwater strategy is to deflect external flows around the Site with a perimeter bund and the internal flows are to be collected via grading and v-swale drains. Flow upstream of the perimeter bund will follow the natural contours of the site to the East and West, as observed prior to the construction of the tank site. The flows from the new tank site are to be collected in a detention basin to attenuate flows and to meet pre-development requirements and additionally provided water quality improvement via detention basin. The preliminary layout available will need to be adjusted to accommodate the stormwater management strategy and design development.

The detention basin should incorporate scour protection at both the inlet and the outlet, as well as having an unobstructed spillway that discharges to the existing road reserve for major rain events. The detention basin is to have preferred 1:6 batter slopes (can be reduced) and not have a depth greater than 1m with 0.3m dedicated to free board as a safety margin (AUSTROAD 2024).

The detention basin provides a secondary benefit to the site, allowing limited storage on site for uncontrolled overflow and controlled scouring of the tanks located at the site. For either of these scenarios, discharging into the detention basin will be via a Type VI Stilling Basin, to reduce the energy associated with the discharge and required scour protection. Discharge during an uncontrolled release may be at a rate of up to 1.326 m<sup>3</sup>/s in a peak overflow event. It is noted that the detention basin is not designed to accommodate these flows and has been sized for stormwater only, however, provides some buffer for operators to respond prior to these flows discharging directly to surface.



Stormwater associated with the Future Site (shown in Grey to the South) will be managed separately by an independent Stormwater Management Plan in future, when the design and construction of the future tank site is undertaken (timing unknown). It is noted that space exists to the West of the Future Site location within the land parcel for an additional basin if required in future.



## 4.4 Analysis outcomes

### 4.4.1 Pre-development scenario

The project site is as discussed is situated on agriculture land that is 100% previous, with approximately half the catchment discharging to the road swales that run along Kalperri Rd and the other half discharge to natural water course located in eastern portion of the site. The land lot area (Site Area) is shown in Table 7.

**Table 7** Site Area

|                                                     | Area (Ha) |
|-----------------------------------------------------|-----------|
| <b>Site Area</b>                                    | 10.27     |
| <b>Tank and Associated Infrastructure Footprint</b> | 1.9       |

Being a greenfield site, the catchment was analysed assuming 100% pervious, see Table 8

**Table 8** Pre-development catchment characteristics

|                       | % Impervious | % Supplementary | % Pervious |
|-----------------------|--------------|-----------------|------------|
| <b>Site Catchment</b> | 0            | 0               | 100        |

The pre-development flow rates for the 10% AEP, 5% AEP and 1% AEP design storm were determined from DRAINS using ARR 2016 IFD's. It is assumed the flows are contained on site with the longest path at 200m traveling from the north to the south with an average slope of 6% and a time of concentration (Tc) of 20 mins. To allow for comparisons with the post-development flow under future conditions (e.g. the climate change factors discussed in Table 3), the pre-development scenario was subject to the same future conditions, the result of which are displayed in Table 9.

**Table 9** Pre-development flow rates generated from the site for current and future conditions.

| Site Discharge Location    | 10% AEP (L/s) | 10% AEP + CC (L/s) | 5% AEP (L/s) | 5% AEP + CC (L/s) | 1% AEP (L/s) | 1% AEP + CC (L/s) |
|----------------------------|---------------|--------------------|--------------|-------------------|--------------|-------------------|
| <b>Kalperri Rd</b>         | 350           | 658                | 528          | 883               | 922          | 1468              |
| <b>Eastern Watercourse</b> | 267           | 501                | 402          | 672               | 702          | 1118              |

### 4.4.2 Post-development scenario

A DRAINS model has been developed to estimate peak flows and detention requirements for the Site. The model was developed using site-specific input data and assumptions based on the information provided. The analysis was undertaken to understand any limitations to the drainage strategy and identify the extent of detention requirements. The post development impervious catchment areas are made up of the tanks and associated Infrastructure.

The ILSAX hydrological model within DRAINS was utilised and adopted the same parameters as the pre-development model. The proportion of pervious to impervious areas post-developed catchments is shown in Table 10 below.

**Table 10** Post-development catchment characteristics

|                       | % Impervious | % Supplementary | % Pervious |
|-----------------------|--------------|-----------------|------------|
| <b>Site Catchment</b> | 18.2         | 0               | 82.8       |

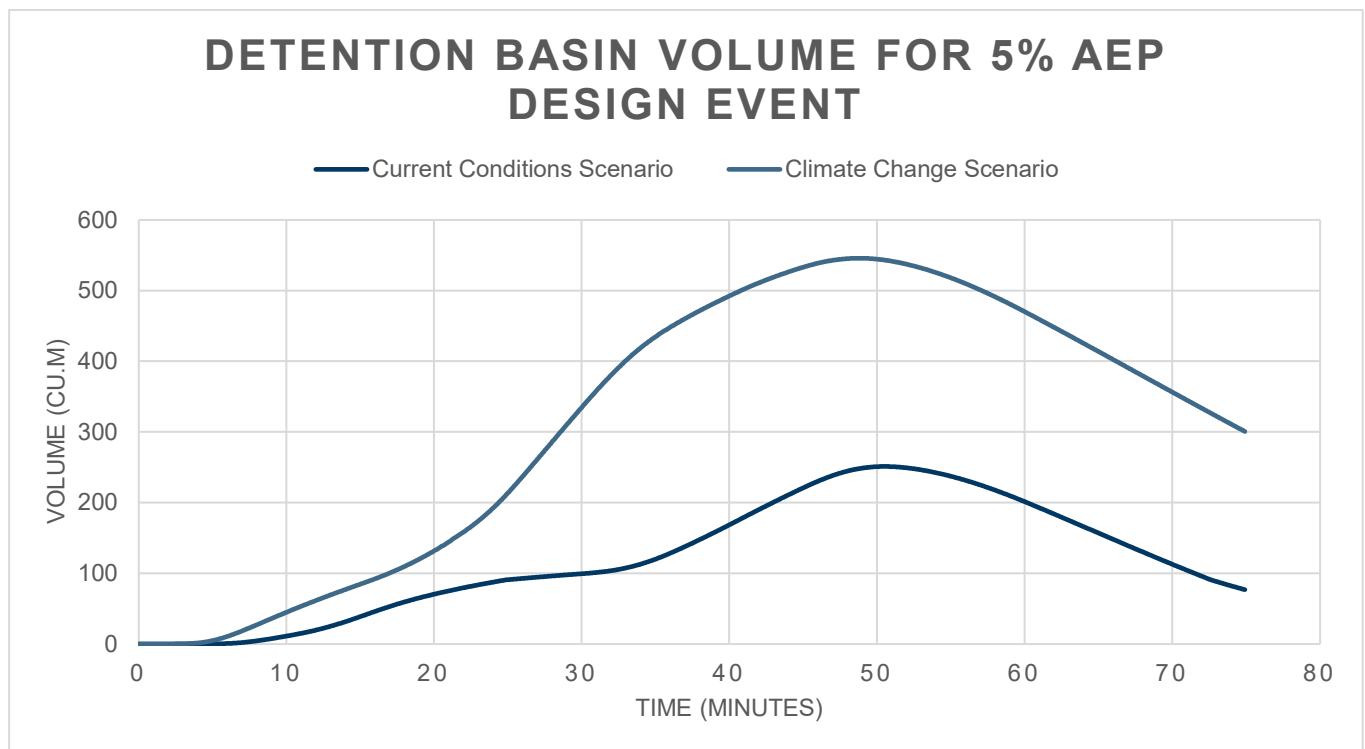
Table 11 displays the results of the DRAINS hydrological model, with all stormwater flows from the development discharging at Legal Point of Discharge 1 (LPD 1). As the post-development flows for the 10% AEP event match or are less than the pre-development flow, the downstream system should have negligible negative impacts to downstream properties and infrastructure. Note that this will continue to be assessed through the development of the design. Table 11 also displays the results of the same DRAINS model but with the 4.5 SSP climate change factor now applied to the IFD data which does results in an increase in post-development flows as expected however these flows still match pre-development flows under a 4.5 SSP climate change scenario. Therefore, preliminary drainages design will meet design requirement under future conditions.

**Table 11** Post-development flow rates generated from the Site under current condition

|                                                  | 10% AEP (L/s) | 10% AEP +CC (L/s) | 5% AEP (L/s) | 5% AEP + CC (L/s) | 1% AEP (L/s) | 1% AEP + CC (L/s) |
|--------------------------------------------------|---------------|-------------------|--------------|-------------------|--------------|-------------------|
| <b>Kalperri Road (including basin discharge)</b> | 350           | 575               | 480          | 719               | 736          | 1190              |
| <b>Eastern Watercourse</b>                       | 217           | 408               | 327          | 548               | 571          | 910               |

#### 4.4.2.1 Stormwater Storage

To reduce post-development peak flow rates (under current condition) to the current condition pre-development flow equivalent, a preliminary detention storage of 260 m<sup>3</sup> is required to meet a 5% AEP design. However, to ensure that there is enough stormwater detention storage under future condition (e.g. climate change). The stormwater detention basin also was sized using a 5% AEP design event with a 4.5 SSP climate change factor applied. This revealed that a preliminary storage of 550 m<sup>3</sup> is need to meet design requirements, stormwater storage for both scenarios are displayed on Figure 11.



**Figure 11** Detention basin volume for a 5% AEP event under current conditions and future conditions

## 4.5 Water quality management

The Water Sensitive Urban Design (WSUD) initiatives that promote collection, treatment and utilisation of water flows within the catchment is encouraged. As such, in addition to managing the magnitude of stormwater runoff, management of the discharge water quality was also considered. In determining an appropriate stormwater treatment system for the Site while working within the constraints of the site, a number of aspects were considered, as discussed below.

Overland flows will eventually migrate downstream into the receiving waterbody, the Sandy Creek, and is therefore important that appropriate consideration is given to pollutants in runoff leaving the study area.

The site is currently undeveloped greenfield site that has been previously used for broadacre agriculture board by a dirt road and associated swale. With the development of the Site, the land use will change but the function of a water utility site is assumed to not dramatically increase pollutants. A tank site has minimal people interactions or sources of pollutant loads but has an increased impervious area, therefore will have a high concentration of runoff and collection but the source loads will be generally very low.

### 4.5.1 Stormwater runoff quality targets

In leu of any local or site specific water quality objectives, the DEW WSUD performance targets have been adopted as the pollutant reduction goal for the site (see Table 12).

Table 12 Sites pollutant reduction targets

|                        | Pollutant Reduction Target (%) |
|------------------------|--------------------------------|
| Total Nitrogen         | 45                             |
| Total Phosphorus       | 60                             |
| Total Suspended Solids | 80                             |
| Gross Pollutants       | 90                             |

### 4.5.2 Treatment train layouts

The modelled treatment train is made up of both primary treatment solution in the form of internal site grassed swales and secondary treatment in the form of a detention basin trapping sediment, this system allows for the successful treatment of both biological and non-biological pollutants.

A model for urban stormwater improvement conceptualisation (MUSIC) model was established in accordance with the drainage strategy proposed for the Site to estimate the treatment efficiency of the proposed WSUD measure above. A layout of purposed the treatment train as modelled in MUSIC is given in **Error! Reference source not found.**



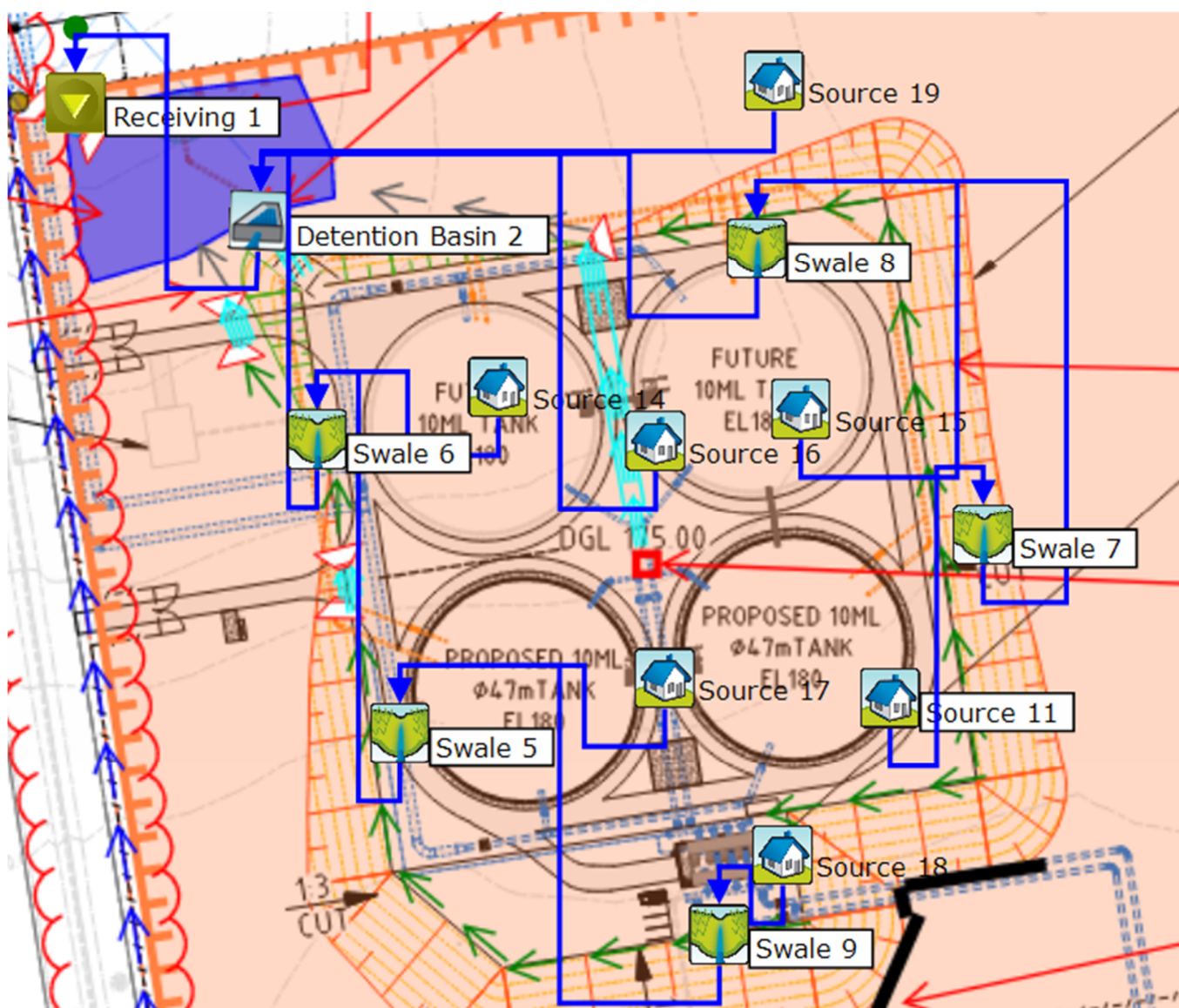


Figure 12 MUSIC model for the Sandy Creek site.

### 4.5.3 Water quality modelling parameter

A MUSIC model was established in accordance with the drainage strategy proposed for the site to estimate the treatment efficiency of the proposed WSUD measure above. In the absence of any site-specific pollutant generation information the preliminary analysis was adjusted to represent low source pollutants from an operating site for the estimated generation of pollutant loads.

#### Summary of Key MUSIC Parameters

| Parameter             | Value                  |
|-----------------------|------------------------|
| Climate Data Source   | Roseworthy AWS         |
| Climate Data Range    | 2001 – 2011 (10 Years) |
| Source Node Soil Type | Clay                   |

|                             |                       |
|-----------------------------|-----------------------|
| Catchment Parameter Used    | Spilt Catchment       |
| Swale Vegetation Height (m) | 0.05 (assume grassed) |
| Detention depth             | 1m                    |
| Basin Surface area          | 550 m <sup>2</sup>    |
| Infiltration rate           | 0.00005 m/s           |
| Swale Batter Slope          | 1:3 or 1:6            |
| WSA Swale Option            | Type B                |

## 4.5.4 Modelling results

The MUSIC modelling results for the site and the treatment train effectiveness summary table is given below in Table 13. The results indicate that the application of the proposed swales and basin will achieve water quality targets in line with best practices as prompted by Water Sensitive SA.

**Table 13** MUSIC model results

| Pollutants                     | Source Load | Residual Load | Reduction (%) | Target Reduction (%) | Target Achieved |
|--------------------------------|-------------|---------------|---------------|----------------------|-----------------|
| Flow (ML/yr)                   | 7.43        | 3.64          | 51.01         | N/A                  | N/A             |
| Total Suspended Solids (kg/yr) | 952.85      | 88.07         | 90.76         | 80.00                | YES             |
| Total Phosphorus (kg/yr)       | 2.55        | 0.52          | 79.78         | 60.00                | YES             |
| Total Nitrogen (kg/yr)         | 16.83       | 6.88          | 59.13         | 45.00                | YES             |
| Gross Pollutants (kg/yr)       | 281.46      | 0.11          | 99.96         | 90.00                | YES             |

## 5. Maintenance

To ensure that the site stormwater system is functioning at maximum capacity, regular maintenance is also required.

The following maintenance activities should be considered as part of the development:

- The paved areas and internal kerb and gutter systems (if required) should be regularly swept to prevent silt and debris blockages.
- The detention basin should be inspected and cleaned out of sediment if required prior to the commencement of each wet season. This is to maintain the basin storage volume. Depending on pollutant loading from the site, the detention basin will require de-silting typically every 3 to 5 years.
- The frequency of inspection of the new proposed stormwater infrastructure system should be determined during the immediate post-construction period. It is suggested that, for the first 12 months, biannual and after every major rain event inspections are carried out to determine the rate of accumulation of sediments and gross pollutants.
- Swale weed control to remove invasive species that could outcompete desirable vegetation and seasonal inspections to prevent blockages and necessary repairs

As the site's stormwater system converges with Council's Kalperri Road, it is recommended that the Council form an agreement with SA Water on inspection and maintenance of the spreader outlet to the road reserve.

## 6. Construction phase

Stormwater management during construction is crucial to prevent soil erosion, water pollution, and damage to surrounding environment. Effective stormwater management strategies ensure that construction activities do not adversely affect the environment. Below are some key practices and measures:

### 1. Erosion and Sediment Control (ESC) Measures:

- Silt fences: Barriers of geotextile fabric or hay bales that trap sediment while allowing water to pass through
- Erosion control blankets: Matting made from natural or synthetic fibres placed on soil to prevent erosion
- Sediment basins: Temporary ponds designed to capture and store sediment-laden runoff, allowing sediment to settle out
- Check dams: Small barriers made of rocks, sandbags, or other materials placed in ditches to slow down water flow and capture sediment

### 2. Stabilisation Practices:

- Vegetative cover: Establishing grass or other vegetation to hold soil in place
- Mulching: Applying a layer of straw, wood chips, or other materials to protect soil from erosion
- Hydroseeding: Spraying a mixture of seed, mulch, and fertilizer onto soil for quick vegetation establishment

### 3. Runoff Control Measures:

- Diversion Drains: Channels that redirect runoff away from disturbed areas
- Swales: Shallow, vegetated channels that slow down, manage overland flows and filter runoff
- Detention Ponds: Basins that temporarily store runoff and release it slowly to prevent flooding and erosion
- Temporary Drainage: to manage the existing flow regime while works are taken place around it

### 4. Good Housekeeping Practices:

- Proper Material Storage: Storing construction materials away from stormwater flow paths
- Waste Management: Proper disposal of construction debris and hazardous materials to prevent contamination
- Vehicle Maintenance Areas: Designating areas for equipment maintenance to prevent oil and other pollutants from entering runoff

### 5. Site Planning and Management:

- Phased Construction: Planning construction in phases to minimise the amount of disturbed soil at any time
- Minimising Soil Disturbance: Limiting the area and duration of soil disturbance to reduce erosion risk
- Stabilised Construction Entrances: Using gravel or other materials at site entrances to reduce soil tracked onto roads

### 6. Regulatory Compliance:

- Permits and Plans: Obtaining necessary permits and preparing stormwater pollution prevention plans as required by local authorities
- Inspections and Maintenance: Regularly inspecting and maintaining stormwater controls to ensure their effectiveness



## 7. Conclusion

This SMP has been developed to provide guidance to appropriately deal with generated stormwater runoff from the Project site and to sustainably manage adverse impacts downstream.

The implementation of the strategies outlined in this SMP will reduce the potential for flooding, convey design flows and minimise detrimental impact on water quality.

The key outcomes and recommendations from this stormwater management plan are:

- To achieve Council's requirements from the Site and discharging into the road reserve for both the major and minor events.
- Utilise a combination of surface and underground drainage components to capture and convey generated stormwater runoff.
- To provide freeboard to the Site's infrastructure and buildings during the 10% AEP design rainfall events.
- To minimise the impact of overland flow paths on infrastructure and can freely discharge into the stormwater system.
- Incorporate detention storage on-site to attenuate post-development flows.
- The preliminary Site layout at the time completing this report will need to be adjusted to accommodate the stormwater management strategy.
- Incorporation of water quality principles within the stormwater system to reduce potential pollutant loading exiting the site and adversely impacting the downstream environment.

Water resources are a valuable element within our natural environment and by adopting sustainable best practices, runoff generated from the development will assist with not adversely impact the receiving environment.



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