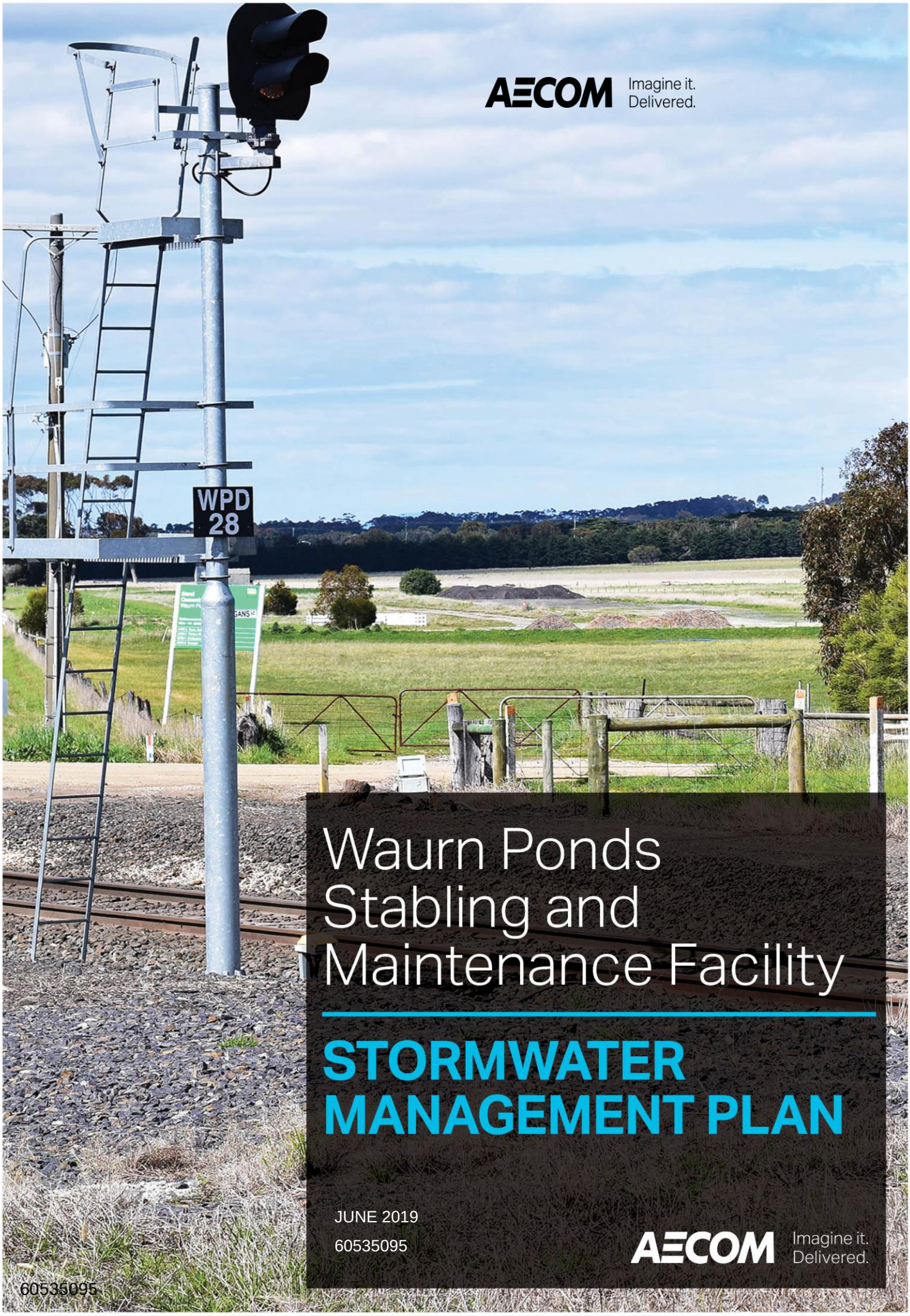


AECOM Imagine it. Delivered.

Waurn Ponds Stabling and Maintenance Facility

STORMWATER MANAGEMENT PLAN

JUNE 2019

60535095

AECOM Imagine it. Delivered.

60535095

Waurn Ponds Train Maintenance and Stabling Facility

Stormwater Management Plan

Client: Rail Projects Victoria

ABN: 69 981 208 782

Prepared by

AECOM Australia Pty Ltd
Level 10, Tower Two, 727 Collins Street, Melbourne VIC 3008, Australia
T +61 3 9653 1234 F +61 3 9654 7117 www.aecom.com
ABN 20 093 846 925

12-Jun-2019

Job No.: 60535095

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

Table of Contents

1.0 Introduction

1.1 Background

AECOM Australia Pty Ltd (AECOM) has been engaged by Rail Projects Victoria (RPV) to prepare a Stormwater Management Plan for the Waurn Ponds Train Maintenance and Stabling Facility (the Project). The Stormwater Management Plan (SMP) has been prepared to inform a planning scheme amendment and has been prepared in accordance with the City of Greater Geelong's requirements.

The report includes:

- A Flood Impact Assessment
- A Drainage Feasibility Report
- A Stormwater Quality Impact Report

The Project is proposed to be located at 255 Reservoir Road, Waurn Ponds as indicated in Figure 1 and Figure 2.

The strategy outlined in this report will assist in inform the future drainage strategy for the Project which will need to be adapted and further developed as the design progresses.

1.2 Project Description

1.2.1 Land Requirements

Project Land – All areas of land required within the Site for the purposes of the Project:

- At 255 Reservoir Road:
  - 350 metres south of the rail corridor between Pettavel Road and Bogans Lane.

Wider Project Land – All land that the Project requires for the delivery of ancillary infrastructure and associated construction activity:

- At 255 Reservoir Road:
  - Approximately 50 metres north of the rail corridor between Pettavel Road and Reservoir Road/Bogans Lane. It is anticipated that only a small portion of this wider project land will be required, subject to the determination of the ultimate location of the occupational crossing as part of Stage 2 of the project.
- Surrounding 255 Reservoir Road:
  - Within the existing rail corridor for approximately 3040 metres west and for 3550 metres east of Bogans Lane inclusive;
  - Within the Bogans Lane road reservation, 500 metres south of Reservoir Road;
  - Within the Pettavel Road road reservation, 170 metres north of the rail corridor and 480 metres south of the rail corridor;
  - Within the Reservoir Road road reservation, 800 metres east of, and including its intersection with Bogans Lane.

Figure 1 shows the regional context of the Project Land and Wider Project Land. Figure 2 shows the above Project Land and Wider Project Land in closer detail.

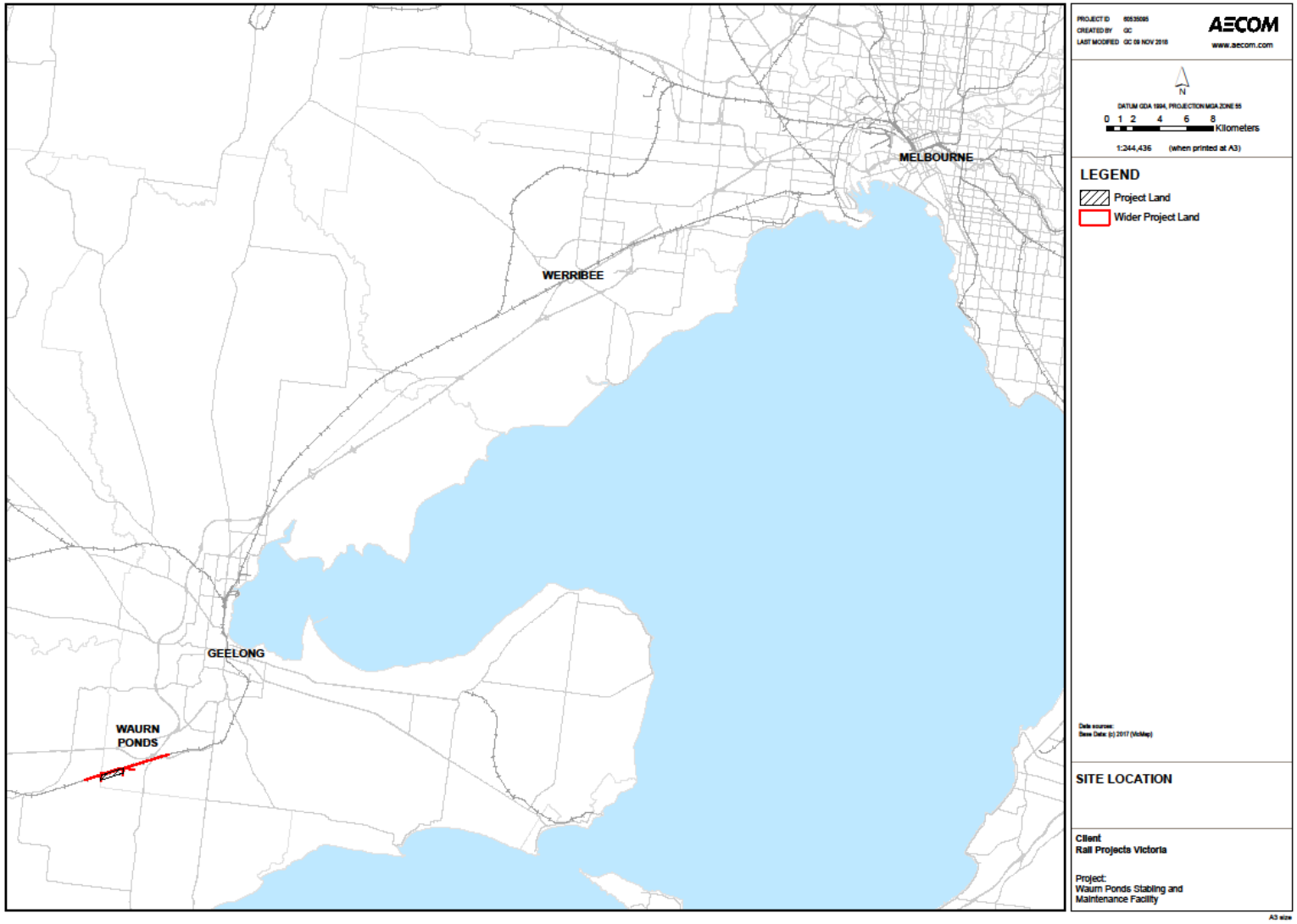


Figure 1 Regional Context Map

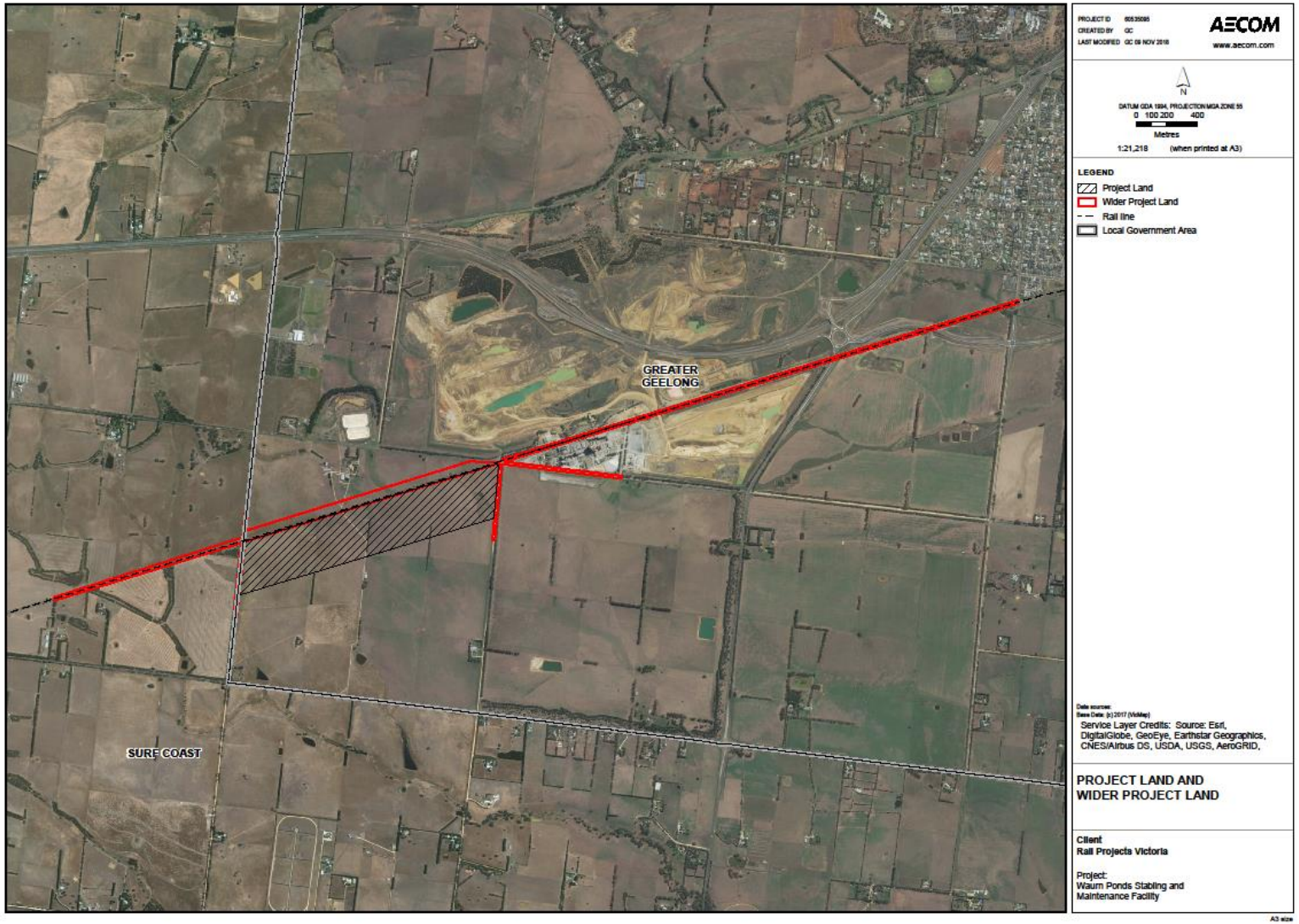


Figure 2 Project Land and Wider Project Land

1.2.2 Staged Delivery

It is proposed to deliver the Project in stages:

- Stage 1 is funded and is expected to be delivered by 2021;
- Delivery of the balance of the Facility (referred to in this report as Stage 2) is subject to further Government decision making in relation to the funding and procurement of new trains to service the Geelong Line and broader regional rail network and associated stabling and maintenance requirements. The timing for delivery of Stage 2 is unknown at this time. Stage 2 may be delivered in one or more stages depending on the outcome of this decision making.

Figure 3 presents the Concept Design for the Project. The Concept Design is indicative only and may be subject to change through the detailed design process.

1.2.2.1 Stage 1 Infrastructure

Stage 1 is anticipated to deliver a train stabling facility with the capacity to stable 6 trains. It is anticipated that the facility will primarily cater for VLocity/DMU trains, however, it is proposed to have capacity to cater for 3 locomotive trains in the short-term while locomotives continue to be phased out of the V/Line fleet. The facility would be located south of the existing railway corridor, directly east of the existing farm laneway at the centre of the Site, and west of Bogans Lane. The Stage 1 facility would occupy an area of approximately 11 hectares, and would be in the order of 1030 metres long, 150 metres wide at its widest section and 100 metres wide at its most narrow point.

Stage 1 is anticipated to comprise:

Initial site development

- Land acquisition for the entire footprint of Stage 1 and Stage 2;
- On-site mobilisation;
- Connections to key services (electricity, water, sewerage, drainage, communications, etc.);
- Security fencing and entrance/exit gates around the perimeter of the stabling roads and Stage 1 facilities;
- Earthworks to support initial facilities and trackwork;
- Landscaping;
- Road access from Bogans Lane;
- Power and dam infrastructure works resulting from the acquisition of farmland for the facility site;
- Modified stock crossing and vehicular access to the adjacent leasehold farm property (i.e. the Boral owned land to the east);
- It is expected that the existing level crossing that serves the central farm laneway will remain in operation at its current location, potentially with some modifications as required by V/Line.

Track layout

- Six stabling roads, comprising four single ended and two double ended stabling roads;
- One single entry/exit train access point from existing rail corridor towards the eastern end of the site, just west of Bogans Lane.

Servicing facilities

- Fuelling facilities on four stabling roads;
- Power, toilet extraction and water replenishment equipment, footpaths and yard lighting provided on all of the stabling roads.

Ancillary facilities

- Upgrades to the existing signalling system within the rail corridor;
- Waste compound for rubbish and hard waste;
- Bunded fuelling area;
- Water storage and supply for stabling sidings;
- Drainage systems, including water sensitive urban design (WSUD) and the modification or relocation of farm dams;
- Telecommunications;
- Asphalt footpaths;
- CCTV to cover stabling sidings area;
- Driver and cleaner's amenities;
- Formed and sealed access roadways, with capacity to allow for B-double truck access and turnaround;
- Car parking for drivers, visitors and cleaners.

1.2.2.2 Stage 2

As stated above, Stage 2 is subject to further Government decision making. However, it is anticipated that Stage 2 will increase the stabling capacity of the Facility to 26 trains and will introduce a train maintenance facility. Based on an indicative concept design, the Stage 2 facility is anticipated to occupy an area of approximately 46 hectares, and be in the order of 1720 metres long, 320 metres wide at its widest section and 160 metres wide at its narrowest.

Stage 2 is anticipated to comprise:

Site development

- Security fencing and entrance/exit gates around the perimeter of the Stage 2 facility;
- Earthworks to support expansion of facilities and trackwork;
- Landscaping;
- A rerouting of the farm laneway to cross the rail corridor in proximity to the Pettavel Road boundary of the Site.

Rail facilities

- Two access points from existing rail corridor, one towards the eastern end of the site and one towards the western end of the site;
- Stabling roads for up to 26 trains;
- Bio-wash facilities;
- Train wash facilities;
- A maintenance facility with 5 maintenance roads.

Servicing facilities

- Expansion of fuel and water facilities;
- A substation;
- Expansion of staff facilities;
- One gatehouse along the entry road.

Ancillary facilities may include the following:

- Drainage systems, including WSUD and the modification or relocation of farm dams;
- Telecommunications;
- Internal/external access arrangements;
- Utility protection and installation;
- Signalling infrastructure;
- Emergency access via Pettavel Road.

1.2.3 Construction Phase

1.2.3.1 Construction Activities

Key construction activities anticipated for the Project include:

Table 1 Construction Activities

Stage	Construction Activities
Stage 1	
Site Development	• On-site mobilisation; • Connections to key services (electricity, water, sewerage, drainage, communications); • Security fencing and entrance/exit gates; • Earthworks to support initial facilities and trackwork; • Road access from Bogans Lane; • Initially required internal roads; and • Security and safety facilities.
Works	• Construction of internal roads, footpaths, car parking and associated sealing; • Construction of new rail tracks and associated signalling systems; • Construction of fuelling facilities; • Reinstatement and landscaping; • Installation of utility infrastructure; • Bulk earthworks; and • Construction of ancillary buildings and services.
Stage 2	
Works	• Construction of train maintenance building and internal fit out; • Construction of additional tracks and connections; • Modifications to the fuelling facility; • Automated train wash plant and bio-wash; • Extension of stabling sidings; • Expansion of staff amenities and training facilities; • Provision of train cleaners store and amenities building; • Expansion of staff car parking; • Provision of train crew administration facilities.

Being grazed farmland, the site is already substantially cleared of vegetation. The exception is two areas of linear shelterbelt vegetation. Vegetation removal will be minimised to the extent practical and occur progressively throughout all activities.

1.2.3.2 Construction Operation

The construction duration is expected to be approximately 12 to 18 months for each stage of the Project, and subject to the Project requirements at the time. During each phase, the construction operating hours will be undertaken in accordance with the relevant protocols.

During the site preparation and construction phases, access to the site is anticipated to be provided via Bogans Lane for Stages 1 and 2. Alternative access may be possible from Pettavel Road for Stage 2.

Vehicle movements would be coordinated as required and advised by standard traffic management measures.

The preferred site access route during construction of the site is via the Geelong Ring Road. Alternatively, access to the site can be provided via Princes Highway.

1.2.3.3 Staff Numbers

During the construction phase it is expected that up to 100 personnel could be on-site at any one time.

1.2.4 Operational Phase

This section describes the expected operational activities.

Operational activities are subject to completion of the detailed design phase for each stage of the Project and confirmation of the operator's timetabling requirements.

1.2.4.1 Operation of Train Stabling and Maintenance Facilities

The Facilities are anticipated to operate 24 hours a day, seven days a week.

It is expected that trains will enter and exit the facility from turnouts constructed off the mainline. The layout of the track work would enable flexibility for the train operator and maintainers to minimise any potential conflicting train movements, and reduce the overall amount of shunting time onsite for the trains.

It is anticipated that trains will enter and exit the site during the day and night as required to serve the railway timetable. Trains may arrive/depart at 10 minute intervals during peak periods. The total number of train arrivals and departures per day is not yet known and will be subject to the operator's timetabling requirements.

It is assumed that up to 3 trains may be idling at any one point in time during Stage 1 operations. The total number of trains idling as part of Stage 2 is subject to future detailed design and operational requirements. These assumptions will be reviewed subject to the operator's timetabling requirements.

The overall operational concept for the Facility is to provide an efficient series progression for stabling, servicing and maintenance (if required) of trains from initial train arrival until its next scheduled departure into revenue service. Typical train movements would be entry through the northern most fuelling roads, continuing through to the western most shunting neck. From here the train would head east into the stabling roads where it would reside prior to departure. If maintenance was required, trains would leave the stabling siding and enter the maintenance facility.

1.2.4.2 Staff numbers

It is anticipated that the Facility may accommodate 10 staff during Stage 1 of the Project and 40 staff during Stage 2, with the expectation that all staff will not be on site at any one time, and staff will work in shifts. An expected breakdown of shift allocation is as follows:

Table 2 Staff Numbers

Shift Time	Staff Percentage	Number of Staff for Stage 1	Number of Staff for Stage 2
Morning	40%	4	16
Afternoon	40%	4	16
Overnight	20%	2	8

1.2.4.3 Vehicle and Staff access

The primary access point to the Facility would be located to the east from Bogans Lane. The preferred access route to the site from the Geelong Ring Road would be via Anglesea Road and Reservoir Road. Vehicles will be expected to exit the site the same way.

The primary access gate is to be utilised by staff and delivery vehicles to both enter and exit the facility. Visitors and administration office personnel would be directed to the relevant area and directed to the car park after checking-in, identification and registration at the primary access gate.

For Stage 2, emergency vehicle access could be provided at the western end of the site from Pettavel Road, where required. Appropriate internal access would also be provided for emergency vehicles to the maintenance workshop, stabling tracks and main parts of the Facility.

The internal road layout would be designed to limit the need to cross tracks within the site.

Adequate car parking spaces will be provided for both maintenance and operations staff and visitors. It is expected that car parking areas will be located to minimise walking distances to site facilities.

Pedestrian movement networks would be designed to provide adequate access, minimise walking distances to site facilities and provide for personal safety.

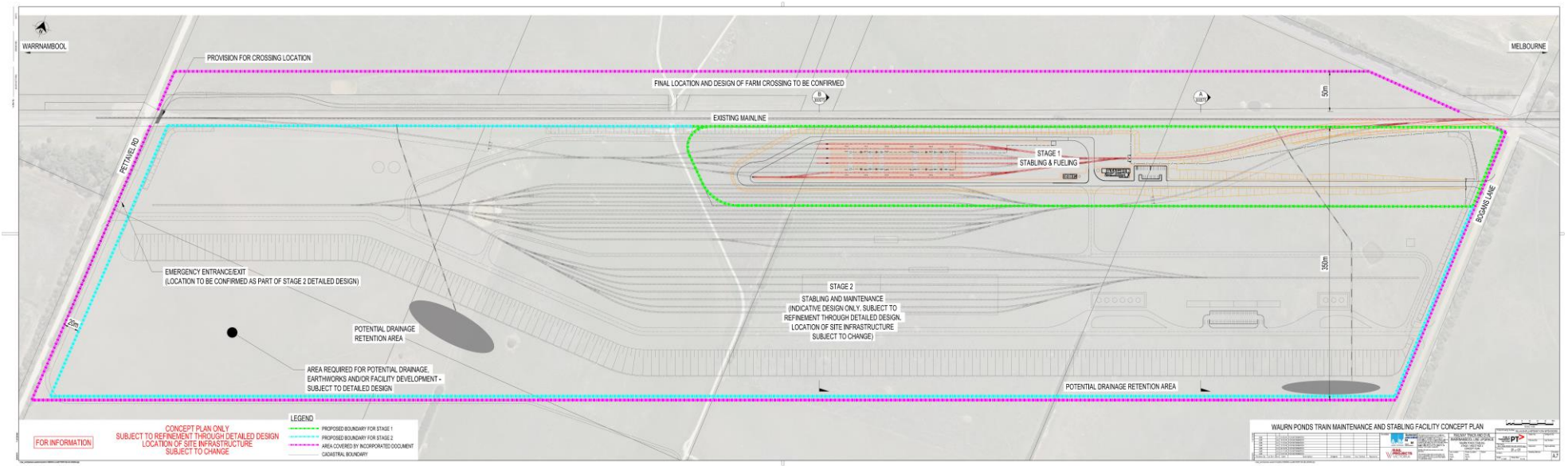


Figure 3 Concept Design

1.3 Consultation

Consultation was undertaken with the City of Greater Geelong in November of 2016 where Council advised the requirement for a stormwater assessment was to be undertaken in accordance with the *City of Greater Geelong Stormwater Management Guidelines* (the Guidelines).

According to the Guidelines, a Stormwater Management Plan (SMP) at a Concept/Feasibility Stage should include:

- A Flood Impact Report
- A Drainage Feasibility Report
- A Water Quality Impact Report

The Guidelines have been adopted to produce a combined report that addresses flood impact, drainage feasibility and water quality. Where information requested in the Guidelines is not necessary or relevant to this assessment, reasoning for the omission is provided, this occurs specifically in Section 4.0.

1.4 Planning Considerations

The Project Land is located within the City of Greater Geelong. Planning Policies within the Greater Geelong Planning Scheme with relevance to Stormwater Management are as follows:

- Clause 21.05 Natural Environment
  - Clause 21.05-2 (Waterways) seeks *'to protect, maintain and enhance waterways, rivers, wetlands and ground water.'* Strategies of relevance to the project include:
    - '*Ensure that land use and development avoids isolating wetlands and provides for connective water flows and vegetative links.'*
    - *Ensure waterways and wetlands are not drained or adversely affected as a result of development.*
    - *Effectively manage stormwater runoff from development.'*
  - Clause 21.05-6 (Natural resource management) seeks to '*use non-renewable resources more efficiently and to increase these of renewable resources*'. Strategies of relevance include:
    - *'Encourage all land use and development to incorporate best practice Water Sensitive Urban Design (WSUD) principles.*
    - *Encourage the installation of alternative water supply systems. Including the use of recycled water where appropriate.'*
- Clause 21.07 Economic Development and Employment
  - Clause 21.07-2 (Industry) seeks to *'Ensure all industrial development is appropriately serviced by road, drainage, water, sewerage and telecommunications infrastructure.'*

The Project Land is located within the Farming Zone of the Greater Geelong Planning Scheme. Guidelines within the Farming Zone with relevance to Stormwater Management are as follows:

- The purpose of Clause 35.07 Farming Zone (amongst others) includes *'to encourage use and development of land based on comprehensive and sustainable land management practices and infrastructure provision.'*
- Clause 35.07-6 (Decision guidelines) note that the responsible authority must consider (as appropriate) the following:
  - *'The location and design of existing and proposed infrastructure including roads, gas, water, drainage, telecommunications and sewerage facilities.'*

The Project Land is not affected by any overlays of the Greater Geelong Planning Scheme.

It is understood and expected that this Flood Impact, Drainage Feasibility and Water Quality Assessment addresses these Policies by addressing the *City of Greater Geelong Stormwater Management Guidelines*.

2.0 Methodology

2.1 Modelling Approach

The SMP has been informed by the Project Land above and the Concept Plan and Project Description provided by RPV.

The SMP is structured to meet the requirements of Councils '*Guidelines for Stormwater Management Plans (2016)'* and the engineering procedures are consistent with '*Australian Rainfall and Runoff (1987)*' and '*Best Practice Environmental Management Guidelines (2006)'.*

The stormwater analysis has been undertaken using modelling software including:

- Tuflow
- Rorb
- Excel Spreadsheets
- MUSIC

Tuflow has been used to define the existing flood extent and depths for the floodplain under predevelopment conditions and identify changes to the floodplain under the proposed development. Tuflow allows two-dimensional flood modelling which is suitable for this site due to the flat terrain and poorly defined waterways. Rorb was used to generate hydrographs to be used in the Tuflow model which is consistent with the Melbourne Water '*Flood Mapping Projects Guidelines and Technical Specification (Nov 2016).*'

Due to the preliminary and conceptual nature of the design, spreadsheets were used to size retarding basins to retard flow rates form the developed site to predevelopment levels. The basins can be sized using other hydraulic software when the design progresses and internal the internal drainage network is more fully defined. MUSIC, an industry standard water quality tool, has been used to undertake preliminary sizing of wetland areas, however internal use of vegetated swales or biofiltration could also be used to reduce this requirement as the design progresses.

Details of the model development and methodology are included in the individual sections below.

2.2 Data Collection

Topographical and rainfall intensity data was gathered from the site to build the hydrological and hydraulic models.

Feature survey was available for the site, including the existing rail elevation and hydraulic structures. 2008-9, 1m DEM and 0.5m contours we purchased from Land Victoria for areas upstream and downstream of the site to enable catchments to be delineated and flood mapped beyond the site boundary.

Rainfall data for the assessment was obtained from the Bureau of Meteorology for Waurn Ponds.

2.3 Hydrological Model Development

A Rorb model was developed to generate hydrographs representing peak flow rates within the catchment for the pre-developed, 1 in 100 year Average Recurrence Interval (ARI) storm event. A figure delineating the catchment boundaries is provided in Appendix A. There are several existing farm dams on site however these have not been included in the models as they are not formal drainage assets and their ability to attenuate flows during storm events cannot be assured.

Hydrographs were produced for three locations upstream of the existing rail embankment at:

- The western watercourse near Pettavel Road

- The central watercourse which passes through the existing railway corridor
- Upstream of Reservoir Road at the eastern edge of the upstream catchment

The eastern hydrograph was located so that the impact of the road on flows upstream of the rail corridor could be captured by the hydraulic model.

The Rorb model was calibrated to peak flow rates for the three hydrograph locations determined by the Rational Method. This method was adopted as the upstream catchments are small, and there is no stream gauge data available. The method is defined in '*Australian Rainfall and Runoff (1987)*'. The storage parameter, Kc, was then varied within the model until the flows matched those determined by the Rational Method. The parameters used in the Rorb model are listed in Table 3 and are consistent with the values listed in the Melbourne Water Land Development Manual.

Table 3 Rorb model parameters

Parameter	Value
Kc	1.05
m	0.8
Initial Loss (mm)	15
Runoff Coefficient	0.6

The model was run for a range of storm durations to identify the critical storm event. The peak flow rates and corresponding storm durations are listed in Table 4

Table 4 Design Flow Rates (100 year ARI)

Location	Flow Rate (m^3/s)	Storm Duration (minutes)
Western watercourse	1.6	60
Central watercourse	2.3	120
Upstream of reservoir Road	0.9	120

2.4 Hydraulic Model Development and Calibration

A TUFLOW two-dimensional flood model was developed to determine the existing flood characteristics and assess the impact of the proposed works. The model was based on available topographical data and the 100 year ARI hydrographs were applied upstream of the existing rail corridor.

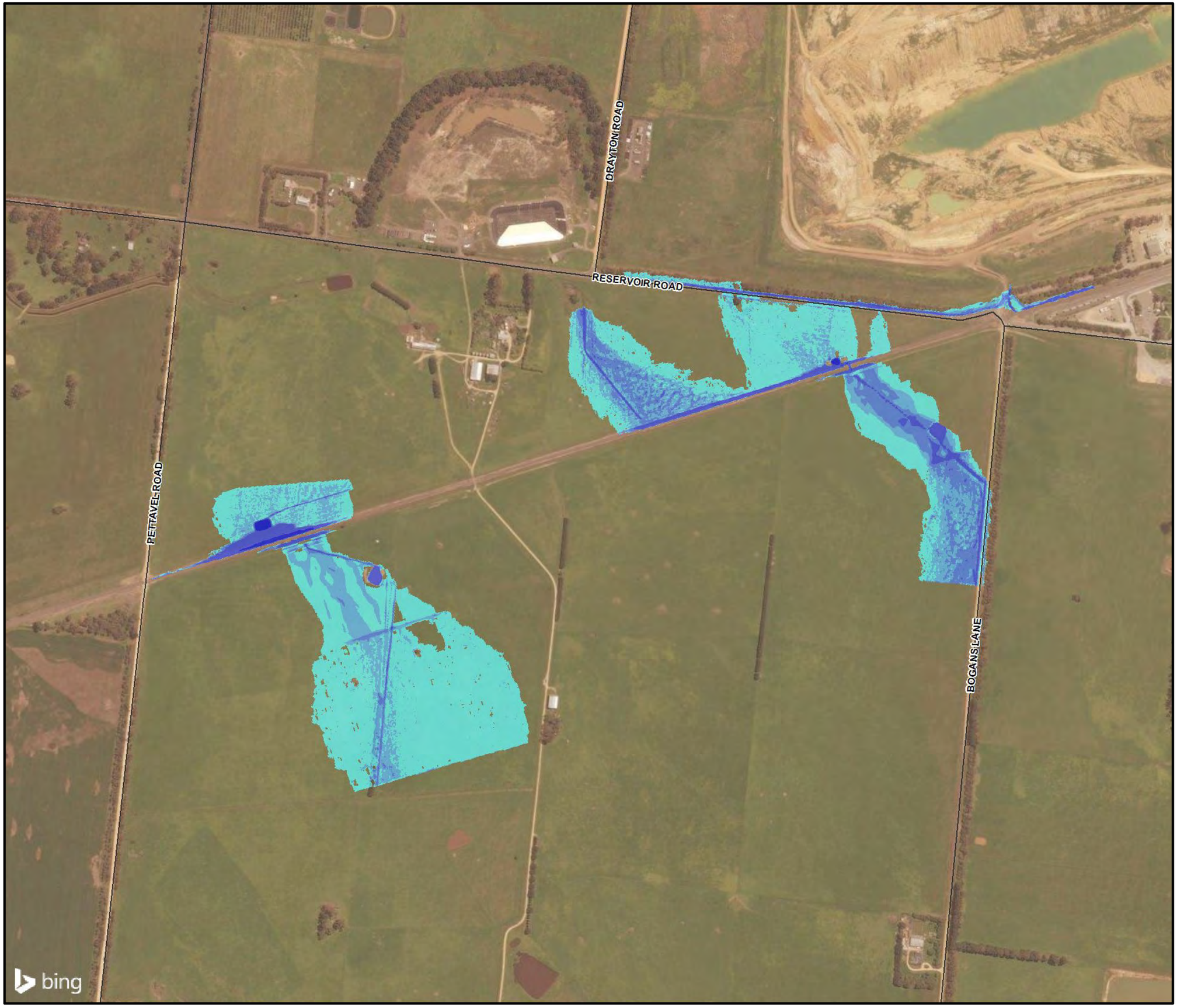
Roughness parameters were applied to represent grassed surfaces and a free boundary condition was applied to the downstream boundary.

No calibration of the hydraulic model was undertaken as there is no alternative flow depth data or flood mapping available.

3.0 Existing Conditions Assessment

The flood modelling indicates that the existing rail corridor impedes overland flows to a small extent on the upstream side but does not overtop during the 1 in 100 year ARI event. Flow depths are generally shallow and do not exceed 100mm apart from some isolated locations and where there are existing farm dams. The shallow flow depth is due to the low flow rates and undefined water courses.

The modelling also indicates that flows from a portion of the upstream catchment are retained by Reservoir Road and are diverted to the east. The flood depth under existing conditions is shown in Figure 4 while existing flood levels are indicated in Figure 5.



PROJECT ID 60535095
CREATED BY MG
LAST MODIFIED MG 06 MAR 2017

AECOM
www.aecom.com

DATUM GDA 1994, PROJECTION MGA ZONE 55

0 50 100 200

Metres

1:7,000 (when printed at A3)

LEGEND

Flood Depth (m) - 1% AEP

- 0 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.11 - 0.5
- >0.5

Data sources:
Base Data: (c) 2017 (VicMap)
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

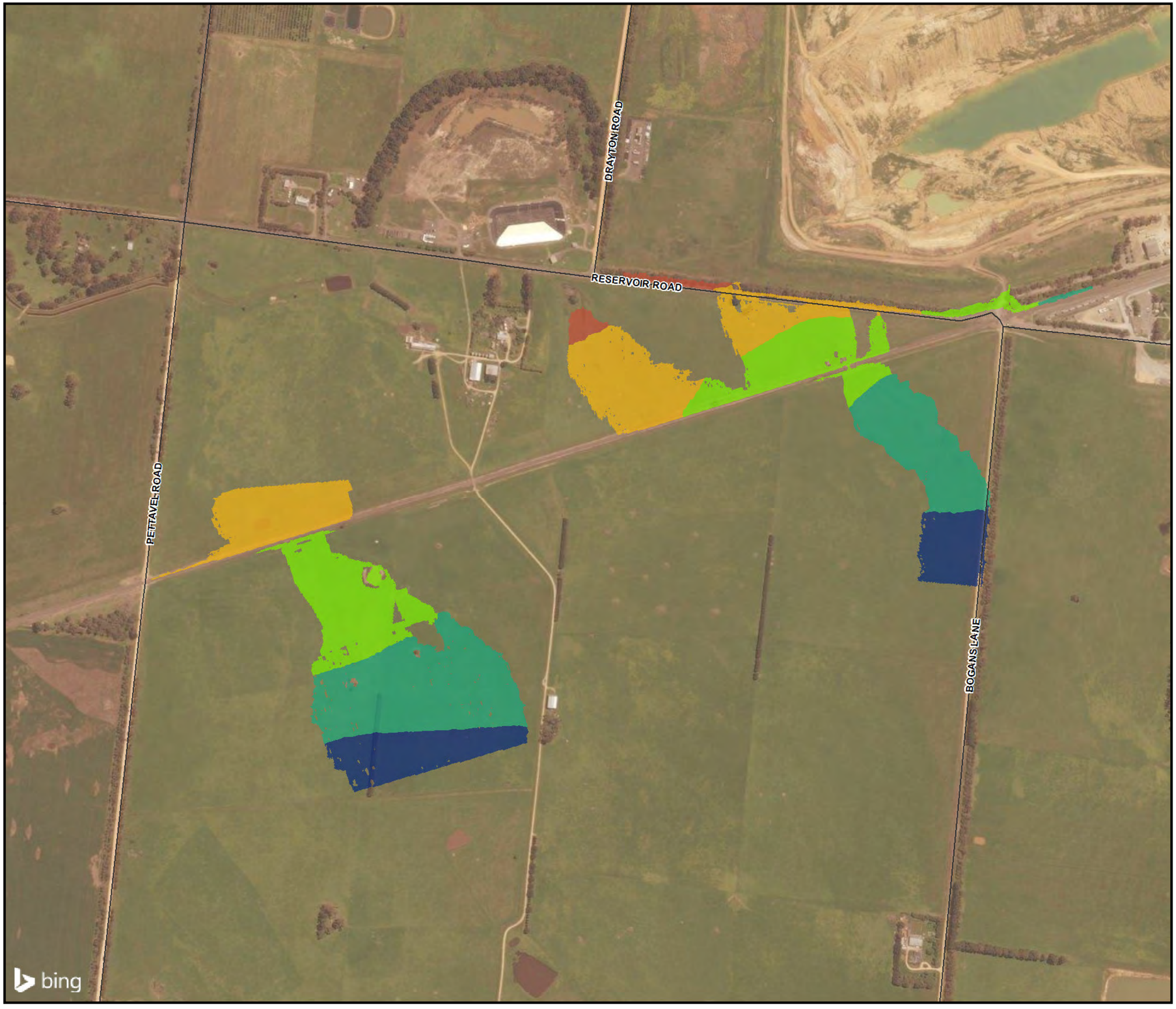
Existing Conditions - Flood Depth

Client
Rail Projects Victoria

Project:
Waurn Ponds Train Stabling and Maintenance Facility

Figure
4

A3 size



PROJECT ID 60535095
CREATED BY MG
LAST MODIFIED MG 06 MAR 2017

AECOM
www.aecom.com

N

DATUM GDA 1994, PROJECTION MGA ZONE 55

0 50 100 200

Metres

1:7,000 (when printed at A3)

LEGEND

Flood Inundation - 1% AEP

- 87.2 - 90
- 90.01 - 95
- 95.01 - 100
- 100.01 - 105
- 105.01 - 110

Data sources:
Base Data: (c) 2017 (VicMap)
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
© 2017 DigitalGlobe © 2017 GeoEye Earthstar Geographics SIO © 2017 Microsoft

Existing Conditions - Flood Inundation map

Client
Rail Projects Victoria

Project:
Waurn Ponds Train Stabling and Maintenance Facility

Figure
5

A3 size

4.0 Sensitivity Analysis

No sensitivity analysis has been undertaken for the flood assessment as there are no specific catchment features or outcomes that would be significantly affected by a change in flood depths or extents.

5.0 Impact Assessment

The Project will require flows on the downstream side of the rail corridor to be managed to prevent the rail line from being flooded. The following works are proposed to enable the existing flow paths to be maintained:

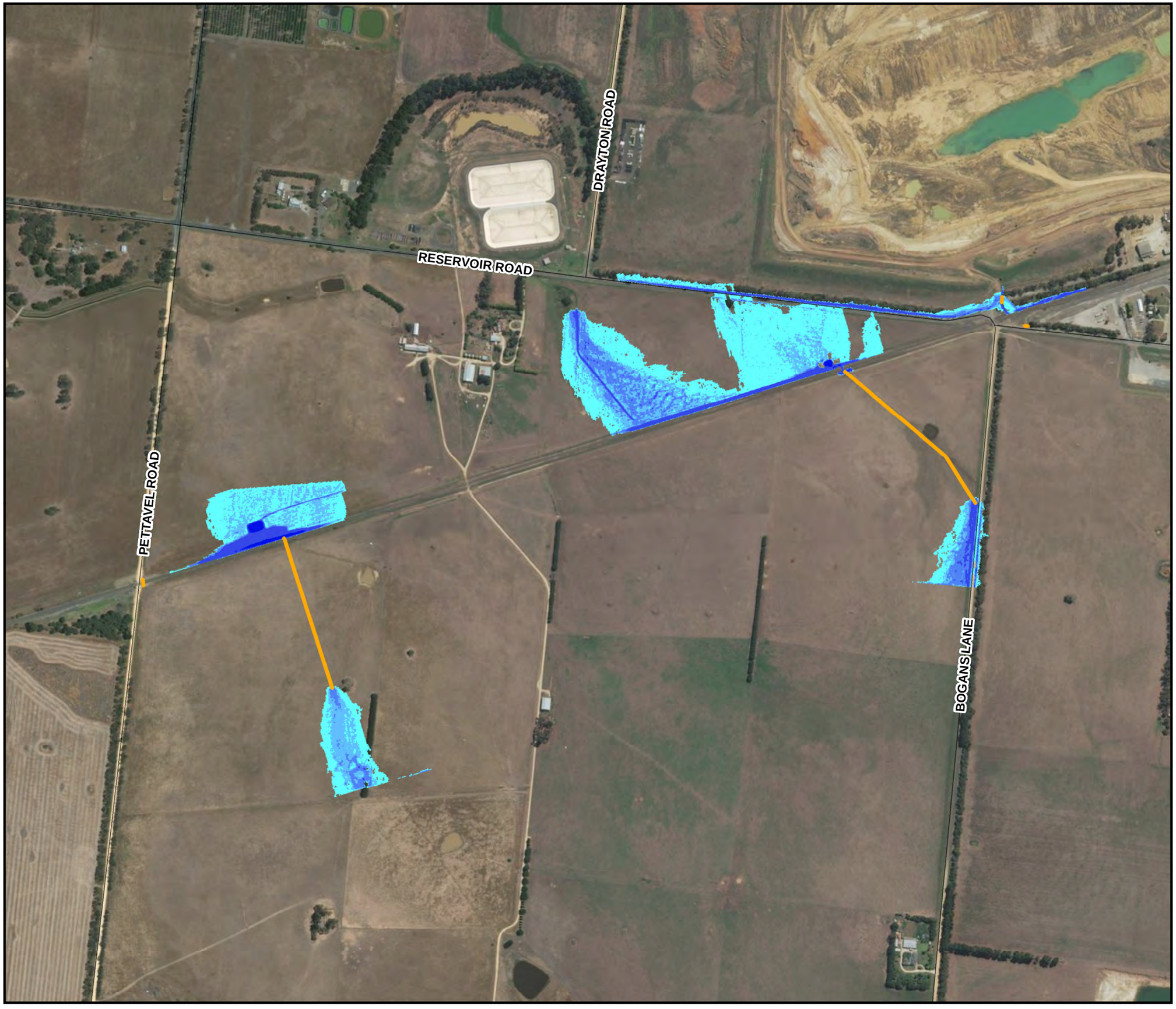
- Extend the existing 600mm diameter pipe at the western water course under the Project.
- Capture flows that pass through the existing rail corridor at the eastern watercourse and convey under the Project in a 1500mm diameter pipe.

The proposed pipes will be connected to the invert of the existing watercourses on the downstream side of the Project.

The TUFLOW model was rerun with the proposed pipes included, to assess the impact on existing flood levels and extents. Figure 6 and Figure 7 indicate the flood depths and flood levels as a result of the Project. The figures indicate that the flow characteristics in the downstream watercourses are only slightly altered, with a reduction in floodplain width for the western watercourse and corresponding increase in depth of approximately 50mm. There is no significant change to flows in the eastern watercourse.

Figure 8 and Figure 9 indicate the flood velocity and flood hazard while Figure 10 indicates the change in floodplain levels resulting from the Project. These indicate a low risk to public safety as a result of fast flowing water. The modelling also indicates that changes in water surface levels downstream of the Project Land boundary are minor for a rural location and could be further mitigated during future design by dispersing the flows.

The final pipe location may vary depending on the final impervious area and rail configuration detail.



PROJECT ID 60535095
CREATED BY CS
LAST MODIFIED CS 29 APR 2019

AECOM
www.aecom.com

N

DATUM GDA 1994, PROJECTION MGA ZONE 55

0 50 100 200

Metres

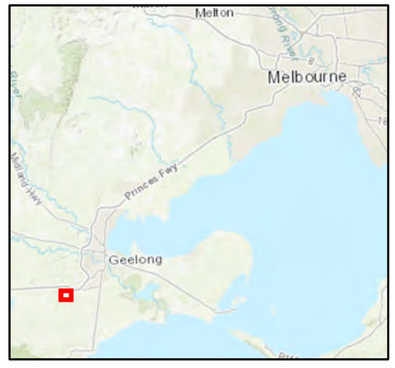
1:7,000 (when printed at A3)

LEGEND

Approximate Culvert Locations

Developed Flood Depth (m) - 1% AEP

- 0 - 0.02
- 0.02 - 0.05
- 0.05 - 0.1
- 0.11 - 0.5
- >0.5



Data sources:
Base Data: (c) 2017 (VicMap)
Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,

Developed Conditions Flood Depth

Client
Public Transport Victoria

Project:
Waurn Ponds Stabling Yards

Figure
6

A3 size

PROJECT ID 60535095
CREATED BY CS
LAST MODIFIED CS 28 APR 2017

AECOM
www.aecom.com

DATUM GDA 1994, PROJECTION MGA ZONE 55
0 50 100 200
Metres
1:7,000 (when printed at A3)

LEGEND

Approximate Culvert Locations

Flood Inundation (m AHD) - 1% AEP

- 87.2 - 90
- 90.01 - 95
- 95.01 - 100
- 100.01 - 105
- 105.01 - 110

Data sources:
Base Data: (c) 2017 (VicMap)
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,

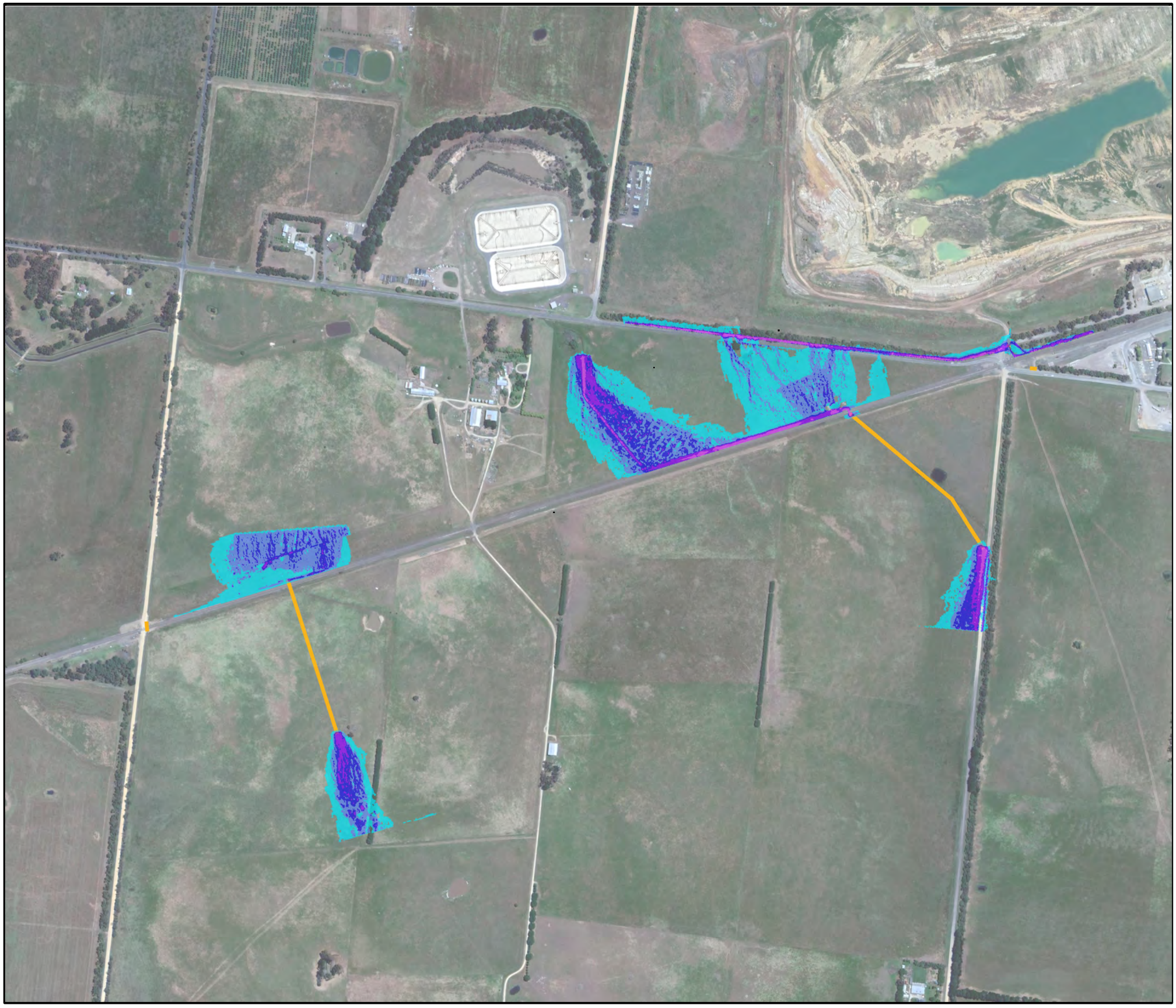
Developed Conditions Flood Inundation Map

Client
Rail Projects Victoria

Project:
Waurn Ponds Train Stabling and Maintenance Facility

Figure
7

A3 size



PROJECT ID 60535095
CREATED BY CS
LAST MODIFIED CS 28 APR 2017

AECOM
www.aecom.com

DATUM GDA 1994, PROJECTION MGA ZONE 55
0 50 100 200
Metres
1:7,000 (when printed at A3)

LEGEND

Approximate Culvert Locations

Velocity (m/s) - 1% AEP

- 0 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 1
- >1

Data sources:
Base Data: (c) 2017 (VicMap)
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,

Developed Conditions Velocity Map

Client
Rail Projects Victoria

Project:
Waurn Ponds Train Stabling and Maintenance Facility

Figure
8

A3 size

PROJECT ID 60535095
CREATED BY CS
LAST MODIFIED CS 28 APR 2017

AECOM
www.aecom.com

DATUM GDA 1994, PROJECTION MGA ZONE 55
0 50 100 200
Metres
1:7,000 (when printed at A3)

LEGEND

Approximate Culvert Locations

Max Velocity X Max Depth (m^2/s)

- 0 - 0.075
- 0.075 - 0.35
- >0.35

Data sources:
Base Data: (c) 2017 (VicMap)
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,

Developed Conditions Velocity X Depth Map

Client
Rail Projects Victoria

Project:
Waurn Ponds Train Stabling and Maintenance Facility

Figure
9

A3 size

PROJECT ID 60535095
CREATED BY CS
LAST MODIFIED CS 03 AUG 2018

AECOM
www.aecom.com

N

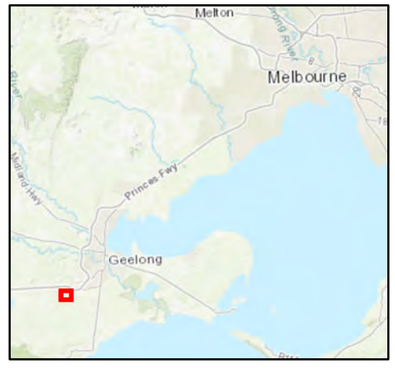
DATUM GDA 1994, PROJECTION MGA ZONE 55
0 50 100 200
Metres
1:7,000 (when printed at A3)

LEGEND

Approximate Culvert Locations

Impact Assesment

- -0.01<
- -0.01 - 0.01
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- Was wet now dry
- Was dry now wet



Data sources:
Base Data: (c) 2017 (VicMap)
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
© 2018 Microsoft Corporation © 2018 DigitalGlobe ©CNES (2018) Distribution

Developed Conditions Impact Assesment Map

Client
Public Transport Victoria

Project:
Waurn Ponds Train Stabling and Maintenance Facility

Figure
10

A3 size

6.0 Drainage Feasibility

Drainage within the Project will be provided by cess drains to convey rail track runoff within the stabling yard. The drains will run longitudinally to the rail and generally follow the existing topography and discharge to two proposed retarding basins before discharging to the existing downstream watercourses. A pipe drainage network will convey stormwater from upstream external catchments under the rail.

Council's guidelines indicate that there are to be no adverse impacts from development. As a result, it will be necessary to provide on-site detention (retarding basins) to prevent an increase in peak flows downstream of the site. A preliminary spreadsheet assessment has been undertaken to determine the approximate storage volume that will be required to attenuate flows to predevelopment conditions. A more detailed assessment will be required as the design is progressed and the internal drainage network and retarding basin configuration is better defined.

When Stage 2 is fully implemented, approximately 2,000m^3 of storage will need to be provided for the western catchment and 4,000m^3 for the eastern catchment. The configuration and sizing of the basins will depend on internal site and track grading and the final extent and design of the development. AECOM has undertaken preliminary earthworks modelling based on the Concept layout provided and it is believed these storage volumes can be incorporated into the design, however this will need to be confirmed during the development of the functional design. The basins have been sized assuming track runoff is kept separate from runoff from the external catchment.

The retarding basins required to attenuate flow from Stage 1 will be significantly smaller than those needed for the ultimate development, and there is sufficient land for the assets to be easily located within the Project Land.

There are several existing farm dams to the south of the site which rely on runoff from upstream catchments to provide water for farm activities. The proposed pipes under the site will convey flow from upstream catchments which should ensure flows to the farm dams are maintained, however downstream stakeholders should be consulted as the design is progressed. Refer to the Agronomist report prepared as part of the planning amendment (*Ag-Challenge Consulting Pty. Ltd, May 2019).*

7.0 Water Quality

Water sensitive urban design elements will need to be incorporated on site to achieve the necessary pollutant reduction levels and comply with the '*Best Practice Engineering Management Guidelines*', (CSIRO, 1999). The Melbourne Water '*MUSIC Guidelines (2018)*' were used to define input parameters.

While there are a number of treatment options, ephemeral wetlands may be suitable as they require minimal maintenance once established. Ephemeral wetlands could be incorporated into the base of the proposed retarding basins to treat stormwater runoff prior to discharging to the downstream watercourses. Other water sensitive urban design treatments such as vegetated swales could also be used to meet the water quality targets but would need to consider other site and operational constraints.

A preliminary MUSIC model was developed to size a wetland that could be used to treat runoff. The results indicated 5,000m^2 of wetlands would be sufficient to meet requirements having regard to the total Project. This area could be distributed evenly over the two proposed retarding basins but may be influenced by grading of internal site drainage.

The performance of the wetland is indicated in Table 5. The final wetland area may vary depending on the final impervious area and rail configuration.

Table 5 Ephemeral wetland pollutant reduction

Pollutant	Target Reduction	Wetland Reduction
Total Suspended Solids	80%	81%
Total Nitrogen	45%	53%
Total Phosphorous	45%	77%

The wetland area required to meet water quality objectives for Stage 1 will be significantly smaller than those needed for the ultimate development, and there is sufficient land for the assets to be easily located within the Project Land.

Operational activities, including maintenance and washing of trains, has the potential to impact downstream water quality. Maintenance facilities should be designed so that polluted water is treated prior to being discharged from the site so as not to impact beneficial uses. Refer to the Agronomist report prepared as part of the planning amendment (*Ag-Challenge Consulting Pty. Ltd, May 2019).*

8.0 Servicing

Barwon Water was contacted to provide advice on the availability of potable water and a sewer connection point to service the Project. The advice indicated potable water is available via a 300mm diameter main in Bogans Lane. The nearest sewer connection is approximately 3.5km away and an on-site pump station and rising main would be required to connect to the Barwon Water Asset. Approval to construct within the public road reserve would be required from Council.

Correspondence from Barwon Water is provided in Appendix B.

A septic system could be provided as an alternative to connecting to the Barwon Water system, however this would depend on the number of people that will be on site and the activities undertaken. Approval from the City of Greater Geelong is required to install a septic system. Wastewater could also be stored on site and removed from site periodically by truck.

9.0 Recommendations for Future Work

The following issues should be considered in future stages of design development:

- Effectiveness of retarding basins should be tested for all ARI's once the configuration of the site and basins are designed.
- The functional design should consider the location and configuration of the retarding basins and wetlands and develop and integrated solution that considers access, maintenance, services and potential contaminated material as well as climate change.
- Consultation should occur with the relevant approval authorities including the Corangamite Catchment Management Authority in the development of the design stage of the Project.
- Legal points of discharge will need to be agreed with relevant authorities.
- An assessment of the need for scour or erosion protection within swales or at pipe outlets should be undertaken once the internal stormwater network has been defined.
- Compliance with future Project Scope and Technical Requirements.
- Management of hydrocarbons and other chemicals including operational procedures.
- Opportunities to achieve credits under the Infrastructure Sustainability Council of Australia.
- No works are likely to be required within the Surf Coast Shire Council area along Pettavel Road.
- Works external to the site such as regrading of local roads may alter flood behaviour and should be considered.

- The works should not alter flows currently supplying existing farm dams to the south of the site.
- The works should not result in a reduction in annual dam yield or water quality.
- Runoff from the site should not adversely impact beneficial uses.

10.0 Limitations

The work undertaken in this report is based on a two dimensional Concept Plan and typical cross section. As the design progresses, more information will be available to define the internal stormwater network. This will influence the location and configuration of the retarding basins and water sensitive urban design features described in this report. The sizes provided should be considered preliminary and the assets should be sized based on the above recommendations as the design progresses.

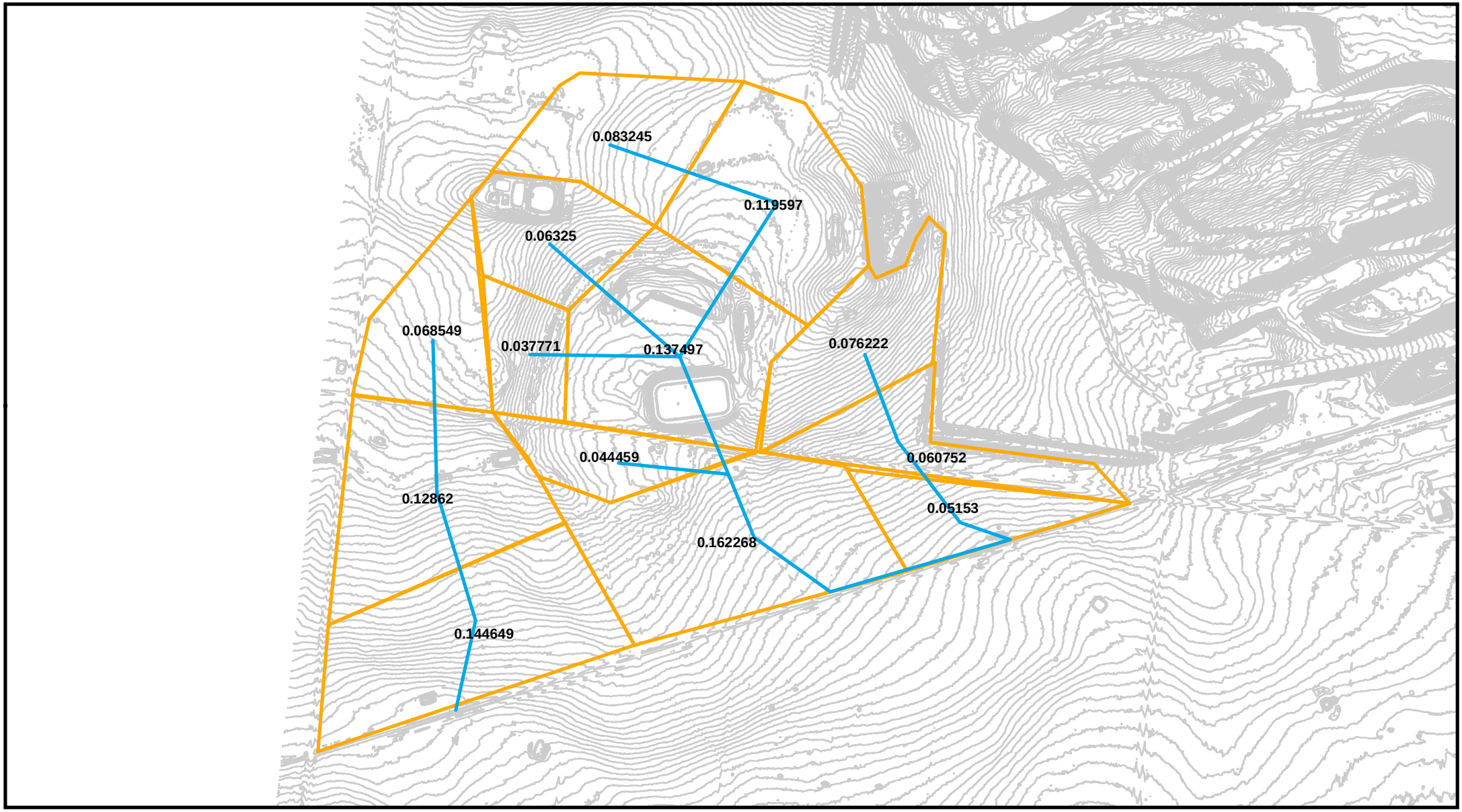
11.0 Conclusion

The above analysis indicates that the Facility will have a minimal impact on the surrounding floodplain with the following elements included in the design:

- Extension of the existing 600mm diameter pipe at the western watercourse.
- Provision of a 1500mm diameter pipe under the rail at the eastern watercourse.
- Approximately 6,000m^3 of on-site detention (retarding basins) downstream of the rail prior to discharging to the water courses. 2,000m^3 has been allowed for in the western catchment and 4,000m^3 in the eastern catchment.
- Approximately 5,000m^2 of ephemeral wetlands to be incorporated into the base of the proposed retarding basins. The areas should be proportional to the contributing catchment areas.

The proposed measures will enable peak flow rates form the site to be restricted to predevelopment levels and water quality can be managed to meet the Best Practice Environmental Management Guidelines. The final size and configuration of the stormwater assets will be dependent on the detailed design of the internal stormwater network and may vary depending on the final impervious area and rail configuration detail.

Appendix A
CATCHMENT PLAN



PROJECT ID 60535095
CREATED BY lachlan.plunkett
LAST MODIFIED lachlan.plunkett 02 AUG 2018

AECOM
www.aecom.com

N

Coordinate System: GDA 1994 MGA Zone 55

0 120 240 480

metres

1:10,000 (when printed at A4)

LEGEND

- Flow Path
- Catchment Boundaries

TUFLOW CATCHMENT PLAN

Rail Projects Victoria

Waurn Ponds Stabling and Maintenance Facility

Waurn Ponds, Victoria

Figure

A

Map Document: (P:\605X\60535095\4. Tech work area\4.3_Engineering\DRAINAGE\GIS\Catchment Plan LS.mxd)

Appendix B

BARWON WATER CORRESPONDENCE

Our Ref: L013997
Enquiries To: Mitch Tennant - Telephone 1300 656 007

15 May 2017

AECOM AUSTRALIA PTY LTD
Via Email: peter.meyers@aecom.com

Dear Peter,

RE: No. 225 Reservoir Road, Waurn Ponds – Rail Stabilising Facility – Servicing Investigation

I write in response to your request dated 15th February 2017 seeking water and sewer servicing advice for land at No. 225 Reservoir Road, Waurn Ponds. This servicing advice is considered 'preliminary advice' and based on information provided by you. Barwon Water will confirm requirements with any response to planning permit referral or application for costs and conditions.

Water

The land at No. 225 Reservoir Road Waurn Ponds is currently provided a water supply by agreement from the existing 300mm water main in Bogans Lane. This water main is fed from the Pettavel basin and based on site elevation it is theoretically possible to supply the proposal however pressure may be an issue.

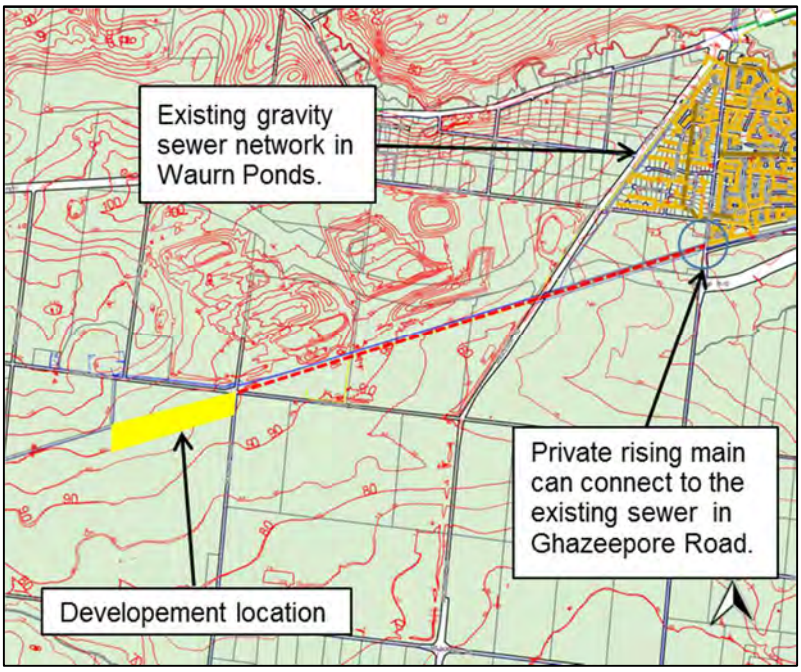
Depending on the needs of the development, onsite storage and pumping could be considered.

Sewer

Figure 1 (below) shows the location of the land in proximity to the existing sewerage system at Waurn Ponds. The distance is approximately 3.5km to the closest part of the system. The distance between the proposed development and existing sewer system is too greater distance use conventional gravity sewer.

A private pump station and rising main (suggested alignment shown as dotted red line) could be installed by the land owner subject to approval by others. Barwon Water would not be responsible for the maintenance and operation of this privately owned sewerage infrastructure.

Figure 1



Barwon Region Water Corporation
ABN 86 348 316 514

P.O. Box 659, Geelong, Victoria, 3220 TEL: 1300 656 007 FAX: +61 3 5221 8236

www.barwonwater.vic.gov.au

Should you have any further queries please do not hesitate to contact Mitch Tennant on 5226 9143

Yours faithfully,

Steven Wallner
Land Development Coordinator
Infrastructure Delivery

AECOM

Collins Square, Level 10,
Tower Two, 727 Collins Street,
Melbourne, VIC 3008

T +61 3 9653 1234
F +61 3 9654 7117

aecom.com