A1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P

Barwon River Ovoid Sewer Aqueduct

Demolition Works

Structural Drawings

Drawing List	
Number	Title
1703-S-0000	Cover Sheet and Drawing List
1703-S-0101	General Notes - Sheet 1
1703-S-1001	Overall Plan and Section
1703-S-1101	Existing Stair Details
1703-S-1201	Existing Stair Plan and Sections
Grand total: 5	

REFERENCE DOCUMENTS:

Documents listed below are to be read in conjunction with this drawing set

Project HIMP Part 1 (Lovell Chen):
20220523 Barwon River Ovoid Sewer Aqueduct HIMP (Part 1)_final
Note this document is to be revised based upon current (partial) propping approach and approved by HV.

Arup Memo outlining history of the different assessment conducted and demolition of the existing structure:
2025-07-07-Structural Engineering and Risk Assessment-BAR-HVP-001

Geotechnical report:
27 Oct 2021
TetraTech Coffey: 754-MELGE292641AB

NOT FOR CONSTRUCTION

Issue	Date	By	Chkd	Appd
P1	07/07/2025	TH	PP	JD
Issue for Information				

ARUP
Level 2, 699 Collins Street
Docklands, Victoria 3008
Tel +61 (03) 9668 5500
Fax +61 (03) 9663 1546
www.arup.com.au

Client: Barwon Water

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

Job Title: C1239 - Barwon River Ovoid Sewer Aqueduct

Sheet Title: Cover Sheet and Drawing List

Scale at A1: 1 : 1
Discipline: Structural
Drawing Status: **For Information**
Job No: **280457** | Drawing No: **1703-S-0000** | Issue: **P1**

7/07/2025 1:57:13 PM

Scope of Drawings

1. This drawing set documents the structural design of retained structures of the Barwon Sewer Aqueduct in Breakwater, Geelong. This set to be read in conjunction with all relevant referenced documents, available original structural drawings and Heritage Victoria and other statutory approval requirements.
2. The design of structural elements as documented in this set is issued For Information. These works are exempt from Building Permit.
3. Temporary works are to be developed and designed by Contractor.
4. Temporary and permanent roads and accessways and their foundations are to be developed by Civil Engineer.

General

1. Structural drawings to be read in conjunction with all appropriate referenced documents.
2. Any discrepancies shall be referred to the Superintendent for a decision before proceeding with the work.
3. Unless otherwise noted, all levels are given in metres and all dimensions are in millimetres.
4. The Contractor shall be responsible for maintaining the stability of the structure until completion.
5. The design presented in these drawings assumes the Contractor (and relevant Subcontractors) are suitably competent and have sufficient experience to interpret the design intent.
6. Contractor's submission requirements are outlined in the project specifications.
7. All materials and workmanship shall be in accordance with all applicable Australian standards and codes of practice except where varied by the specification and/or drawings.
8. The applicable Standards shall be the referenced Standards current at 2023.
9. The contractor is responsible for quality assurance of all completed work.
   Inspections by Arup shall be conducted for compliance with design intent only.
   The contractor shall provide 48 hours notice in advance of any inspections and shall allow sufficient time to make any required modifications arising from the inspection.

Safety/ Condition of Existing Structure

1. The existing aqueduct structure is in very poor structural condition and it should be considered generally unsafe for people to work within close proximity of the structure without suitable protection.
2. A risk assessment has been carried out by Barwon Water, Simpson Constructions and Arup.
3. The demolition works will require significant work in and around the permanent waterway (North and South branch of Barwon River, and Goat Island). Contractor to allow for suitable provisions for access and work around the waterway and interaction with the Corangamite Catchment Authority.
4. Contractor is to comply with all Barwon Water procedures for inductions and site specific requirements.

Design Criteria / Loading

1. Load combinations have been applied in accordance with AS1170.0.
2. Wind and seismic loading has been calculated to AS1170.2 and AS1170.4 respectively and applied to the propping structures.
3. Contractor is to be responsible for managing response to environmental events during the construction phase, such as flood, earthquake and wind. Refer HIMP Part 1 for detail.

Concrete

1. All concrete work to be in accordance with AS 3600.
2. Concrete shall conform to the following UNO
   Cement: Type SL to AS 3972
   Slump: 80mm
   maximum aggregate size: 20mm
   maximum drying shrinkage strain (to AS 1012 part 13) shall not exceed 650 microstrain at 56 days
   Strength grades as shown below. f'c at 28 days.
   Project assessment of concrete strength is required. In addition a minimum requirement of one sample per batch shall apply to concrete in columns, bearing walls and all precast members.
3. Unless noted otherwise, the characteristic concrete strength and clear cover to the reinforcement (including fitments) shall be as follows:

Element	Grade (MPa)	Cover (mm)	Exposure Classification
Pile Caps	50	45	B1
Piles	50	65	Mild (Per AS 2159)

4. Construction joints where not shown on drawings shall be located to the approval of Arup.
   Construction joints shall be roughened prior to concrete setting, or scabbled as required UNO
   Sawn cut joints to be cut after the concrete has sufficiently hardened that it will not be damaged by the sawing but before shrinkage cracking can occur.
5. Formwork shall be in accordance with AS 3610. Design of all formwork by Contractor.
6. Cure concrete by keeping continuously wet for 7 days or by covering with clear plastic sheeting's.
   Alternative equivalent methods of curing may be submitted to the Superintendent for approval.
7. If plastic shrinkage of the concrete is observed due to rapid drying or other conditions,
   apply a single spray coat of aliphatic alcohol evaporation retardant ("MasterKure 111CF-Confilm"
   by Master Builders or equal approved) immediately after screeding.
   Note : "Confilm" is not a curing compound.
8. Formwork for all external corners of exposed concrete shall incorporate a 20 x 20 fillet UNO
9. Slurry to lubricate concrete pump lines shall not be used in any structural member.
10. Low heat concrete shall be used for all beams that are deeper than 700 and have a width greater than 1200. Low heat concrete shall be tested in accordance with AS 1012 Method 22 Part B
    Semi-adiabatic temperature rise of concrete. The temperature rise to be less than 30°C.
    Trial mixes with test results are to be submitted for approval. Low heat concrete is to have a delivery temperature of less than 27°C. Sections cast with low heat concrete are to be insulated by using plywood formwork which is to remain in place for a minimum of 5 days after placing. Also the top surface of the beam is to be insulated with two sheets of formply or similar approved material for a period of 5 days.
11. Surface finish: formed Class 2, Unformed Class B.

Existing Structure Survey and geometry

1. The ground model and existing structure point cloud within this set is based upon Diospatial drone survey data, from site works on 12 December 2023. A tolerance report has been provided by Diospatial to accompany the survey data, refer 240507_23AU074_Barwon Aqueduct Accuracy Statement. Contractor
2. It remains the responsibility of the Contractor to prepare sufficiently detailed shop drawings/models for Arup review, at least three weeks prior to commencement of fabrication of propping elements.

Reinforcement

1. All reinforcement shall be as follows: N = Normal ductility bars, designation D250N to AS/NZD 4671
2. Steel reinforcement for concrete MUST comply with AS/NZS 4671 or AS/NZS 4672. It MUST be cut and bent in accordance with AS 3600, AS 5100 or AS 2870. Acceptable Manufacturer's and processors of steel reinforcement must hold a valid certificate of approval, issued by the Australasian Certification Authority for Reinforcing Structural Steels Ltd (ACRS),or to an equivalent subject to Arup approval. Evidence of compliance with this clause must be obtained when contract bids are received.
3. Clear cover to reinforcement (including fitments) shall be as noted on the drawings. Where not specifically designated cover is to be in accordance with AS 3600.
4. No reinforcement splices shall be made, other than those shown on the structural drawings, without the prior approval of the Superintendent.
5. Welding of reinforcement is not permitted unless shown on the drawings or approved by the Superintendent.
6. All reinforcement shall be secured against displacement and adequately supported with purpose-made chairs / spacers.
7. For items requiring Engineer's pre-pour inspection, give Engineer 48 hours notice of inspect
8. All construction joints are to be scabbled and cleaned per details in the specification
9. Reinforcement laps per AS3600

Post Fix Anchors - Execution

1. Post Installed Anchors" means any anchors or reinforcing bars that are drilled into cured concrete and fixed in place with chemical adhesive
2. All anchors must comply with the requirements of AS 5216:2021 and shall be installed in strict accordance with all manufacturer's instructions and recommendations.
3. All personnel installing anchors shall be AEFAC certified. Records of training are to be kept in the Contractor's QA documentation. It is the Contractor's responsibility to familiarise themselves with all requirements for anchor installation, including but not limited to hole cleanout and roughening.
4. All anchor holes shall be made using the manufacturer's approved drilling method. Diamond coring of anchor holes is typically permitted only if manufacturer approved roughening process is conducted after coring.
5. No existing reinforcing bars or PT tendons are to be cut during the anchor installation UNO. Concrete shall be scanned to locate existing reinforcement prior to installation of anchors UNO. If clashes with existing PT/reinforcement are detected, seek alternative positioning from Arup prior to proceeding.
6. Chemical anchors fixed into solid concrete or core-filled blockwork shall be Hilti Hit-HY 200-T V3 UNO.
7. Chemical anchors fixed into hollow concrete masonry or solid clay masonry shall be Hilti Hit-HY 270 with HAS-U stud UNO. Provide proprietary sleeve system (HIT-SC) for hollow masonry. For hollow masonry, holes to be drilled without hammering function to prevent blowout or damage to masonry unit.
8. Epoxies used to fix reinforcement into solid concrete shall be Hilti RE-500 V4 UNO.
9. All anchors shall be galvanised UNO.
10. Anchors shall be installed with embedment depths, spacing and minimum edge distances as per specific details.
11. Cast in anchors called up in drawings shall not be substituted with drilled anchors unless agreed prior with Arup.
12. Anchor types called up in drawings shall not be substituted unless agreed prior with Arup. Any substituted products must demonstrate compliance to the referenced testing and assessment specifications outlined in AS5216. Anchors without evidence of test data will not be accepted.
13. For overhead installation, underwater (flooded hole) installation or installation in any direction over 250mm, piston plug (HIT-SZ) should be used

Post Fix Anchors - Proof Testing

1. Post fixed anchors and Post-fixed reinforcing bars are to be proof tested on site after install per the below requirements and in accordance with AEFAC Technical Note TN05. All anchors that fail during testing are to be replaced and retested at Contractor's cost.
2. Proof Testing Quantity
   a) 10 anchors to be tested
   b) If no failures are recorded in the first 10 anchors, the testing sample can be reduced to 2.5% of the total remaining anchor population.
   c) If any failures occur in the first 10 anchors, the second 10 anchors in the population are to be tested.
   This shall continue until 10 consecutive tests are recorded with no failures.
3. 100% of overhead anchors shall be tested.
4. Testing load is to be in accordance with AEFAC TN05, Section 7 and manufacturer's requirements.
   Confirm test loading with Superintendent prior to testing.
5. Tests to be carried out by NATA registered laboratory at the contactor's expense.
6. Submissions – the Contractor is to maintain QA records of testing in the project documentation and forward certificates of all test results to the Superintendent.

Abbreviation Legend

Abbreviation	Description
A/R	All round
add	Additional
alt	Alternate
AP	Alternately placed
arch	Architectural
AS	Alternately staggered
B1 / T1	Reinforcement bar layering
B/S	Both sides
bldg	Building
BLK	Blockwork
bm	Beam
bot	Bottom
bpl	Baseplate
cant	Cantilever
cent	Centrally placed
CFW	Continuous fillet weld
CIP	Cast in place
circ	Circular
CJ	Construction Joint
cl	Centreline
col	Column
conc	Concrete
cont	Continuous
crs or c/c	Centres (Centre to centre)
DCJ	Dowelled Control Joint
demo	Demolition
det	Detail
dia or Ø	Diameter
diag	Diagonal
dim	Dimension
dp	Depth/deep
DPM	Damp Proof Membrane
drg	Drawing
EB	Existing Beam
EC	Existing Column
EE	Each end
EF	Each face
EJ	Expansion joint
elec	Electrical
embed	Embedment
eq	Equal
EW	Each way
F/S	Far side
fdn	Foundation
FF	Far face
FFL	Finish floor level
FL	Flat
FPBW	Full penetration butt weld
FRL	Fire resistnce level
GA	General arrangement
galv	Galvanize
h	Height/high
HDG	Hot dip galvanised
horiz	Horizontal
IJ	Isolation joint
KCJ	Keyed Control Joint
Ld	Straight bar development length (Refer tables, general notes)
Ldc	Compression development length (Refer tables, general notes)
Ldh	Hook development length (Refer tables, general notes)
lg	Length
LL	Live load
long	Longitudinal
Lst	Lap splice length
LV	Bar length varies
Lvl	Level
max	Maximum
mech	Mechanical
min	Minimum
misc	Miscellaneous
MJ or PMJ	Movement Joint or Permanent Movement Joint
N/S	Near side
NF	Near face
No	Number
nom	Nominal
NSOE	Not shown on elevation
NSOP	Not shown on plan
NTS	Not to scale
OD	Outside diameter
opp	Opposite
PC	Precast
pl	Plate
PPBW	Partial penetration butt weld
prefab	Prefabricated
prelim	Preliminary
PT	Post tension
rad	radius
RB	Reid Bar (threaded D500N reinforcing bar)
RC	Reinforced Concrete
reinf	Reinforcement
reqd	Required
SCJ	Saw-cut joint
SDL	Superimposed dead load
SFL	Structural floor level
sim	Similar
SOG	Slab on ground/grade
sq	Square
SS	Stainless steel
SSL	Structural slab level

Abbreviation Legend

Abbreviation	Description
std	Standard
T&B	Top and bottom
thk	Thick
thru	Through
TMJ	Temporary Movement Joint
TOC	Top of concrete
TOS	Top of Steel
typ	Typical
U/S	Under side
UNO	Unless noted otherwise
vert	Vertical
w	Width/wide
W/O	Without
WPM	Water proof membrane

NOT FOR CONSTRUCTION

Issue	Date	By	Chkd	Appd
P1	07/07/2025	TH	PP	JD
Issue for Information				

ARUP
Level 2, 699 Collins Street
Docklands, Victoria 3000
Tel +61 (03) 9668 5500
Fax +61 (03) 9663 1546
www.arup.com.au

Client: Barwon Water

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

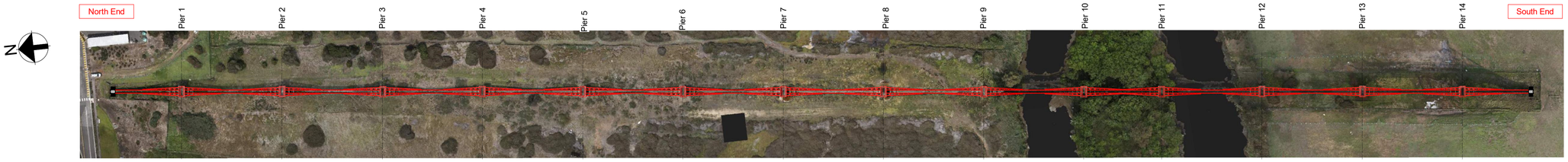
Job Title: C1239 - Barwon River Ovoid Sewer Aqueduct

Sheet Title: General Notes - Sheet 1

Scale at A1: 1 : 1
Discipline: Structural
Drawing Status: For Information
Job No: 280457
Drawing No: 1703-S-0101
Issue: P1

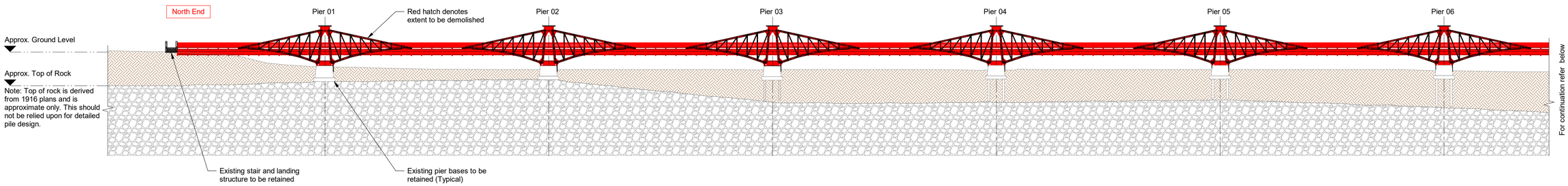
8/07/2025 5:13:34 PM

A1



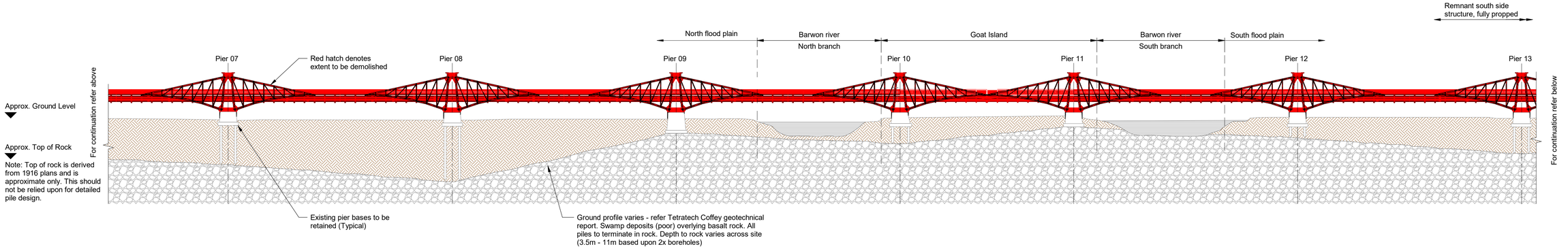
Overall Plan of Works

1 : 1250



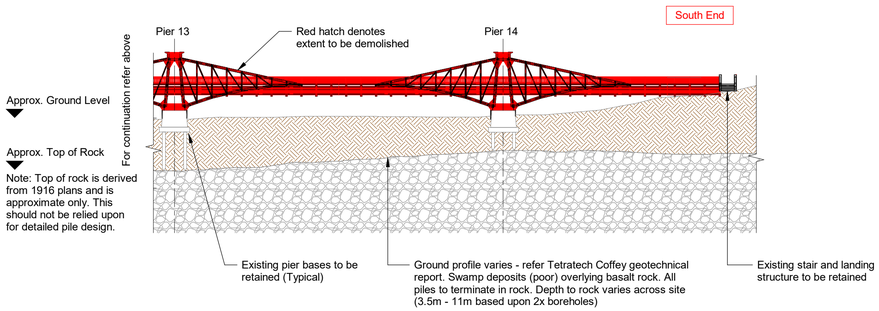
Overall Long Section - Part 1

1 : 500



Overall Long Section - Part 2

1 : 500



Overall Long Section - Part 3

1 : 500

Notes:

1. This drawing provides a general overview of the proposed works current at July 2025 and is to be read in conjunction with Structural Engineering and Risk Assessment-BAR-HVP-001.
2. Permanent fencing and access tracks are not shown here. Refer to SK_ST_006-D for extent of permanent fencing.
3. Red marked components to be demolished.
4. Existing site condition is unknown. Contractor is to confirm the existing site condition and complete the necessary repair work.
5. Contractor to provide the cementitious grout or similar product as per the suppliers recommendation.

NOT FOR CONSTRUCTION

Issue	Date	By	Chkd	Appd
P1	07/07/2025	TH	PP	JD
Issue for Information				

ARUP
Level 2, 699 Collins Street
Docklands, Victoria 3000
Tel +61 (03) 9668 5500
www.arup.com.au
Fax +61 (03) 9663 1546

Client: Barwon Water

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

Job Title: C1239 - Barwon River Ovoid Sewer Aqueduct

Sheet Title: Overall Plan and Section

Scale at A1: As indicated

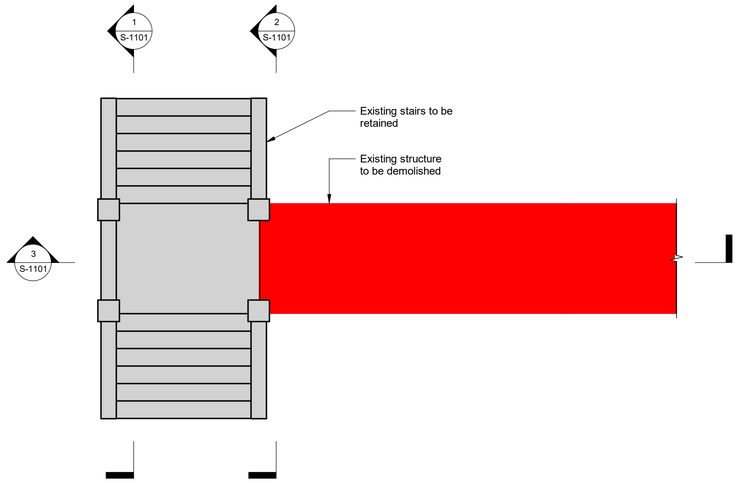
Discipline: Structural

Drawing Status: For Information

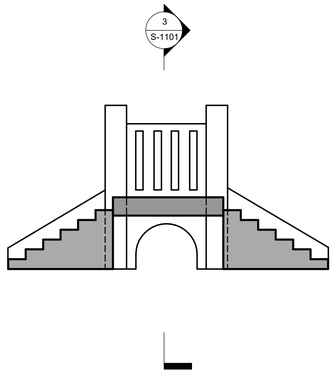
Job No	Drawing No	Issue
280457	1703-S-1001	P1

7/07/2025 1:55:36 PM

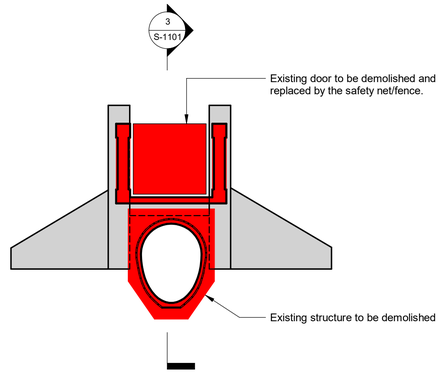
7/07/2025 1:57:15 PM



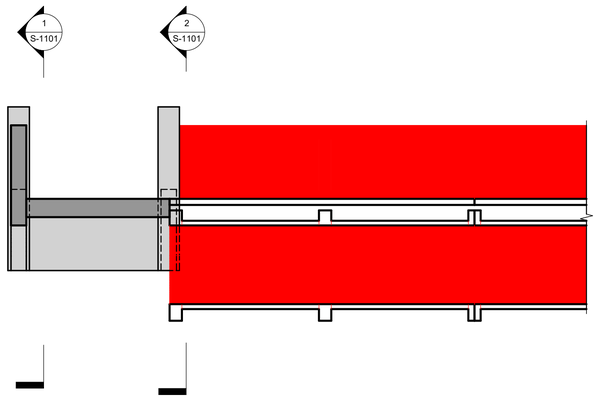
Existing Stair Plan
1 : 50



Section 1
Scale 1 : 50 -



Section 2
Scale 1 : 50 -



Section 3
Scale 1 : 50 -

Notes:

1. This drawing provides a general overview of the proposed works current at July 2025 and is to be read in conjunction with Structural Engineering and Risk Assessment-BAR-HVP-001.
2. Permanent fencing and access tracks are not shown here. Refer to SK_ST_006-D for extent of permanent fencing.
3. Red marked components to be demolished.
4. Existing site condition is unknown. Contractor is to confirm the existing site condition and complete the necessary repair work.
5. Contractor to provide the cementitious grout or similar product as per the suppliers recommendation.

METHODOLOGY:

1. Hydro demolition of the existing structure until good quality concrete/steel is found
2. Drill and epoxy bars as per the requirement.
3. Provide necessary corrosion resistant painting to existing reinforcement.
4. Do necessary concrete patch repairs as per the site condition.

NOT FOR CONSTRUCTION

Issue	Date	By	Chkd	Appd
P1	07/07/2025	TH	PP	JD
Issue for Information				

ARUP
Level 2, 699 Collins Street
Docklands, Victoria 3008
Tel +61 (03) 9668 5500
www.arup.com.au
Fax +61 (03) 9663 1546

Client: Barwon Water

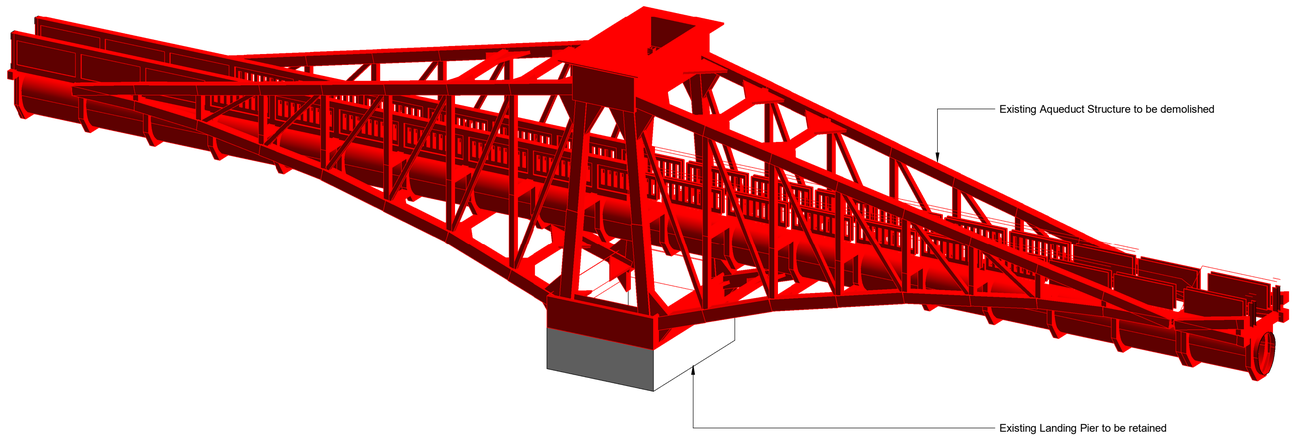
DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

Job Title: C1239 - Barwon River Ovoid Sewer Aqueduct

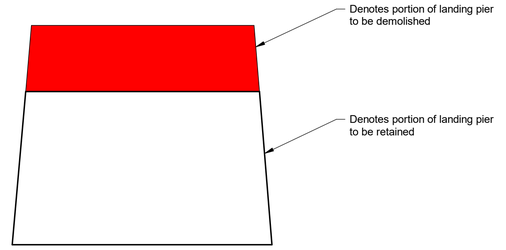
Sheet Title: Existing Stair Details

Scale at A1: 1 : 50
Discipline: Structural
Drawing Status: **For Information**

Job No	Drawing No	Issue
280457	**1703-S-1101**	**P1**

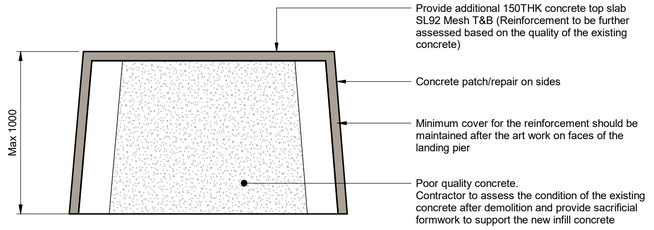


Typical Pier Demolition - Isometric View



Landing Pier Demolition Detail

NTS



Landing Pier Rectification Detail

NTS

Notes:

1. This drawing provides a general overview of the proposed works current at July 2025 and is to be read in conjunction with Structural Engineering and Risk Assessment-BAR-HVP-001.
2. Permanent fencing and access tracks are not shown here. Refer to SK_ST_006-D for extent of permanent fencing.
3. Red marked components to be demolished.
4. Existing site condition is unknown. Contractor is to confirm the existing site condition and complete the necessary repair work.
5. Contractor to provide the cementitious grout or similar product as per the suppliers recommendation.

METHODOLOGY:

1. Hydro demolition of the existing structure until good quality concrete/steel is found
2. Drill and epoxy bars as per the requirement.
3. Provide necessary corrosion resistant painting to existing reinforcement.
4. Do necessary concrete patch repairs as per the site condition.

NOT FOR CONSTRUCTION

Issue	Date	By	Chkd	Appd
P1	07/07/2025	TH	PP	JD

Issue for Information

ARUP
Level 2, 699 Collins Street
Docklands, Victoria 3000
Tel +61 (03) 9668 5500
Fax +61 (03) 9663 1546
www.arup.com.au

Client: BarwonWater

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

Job Title: C1239 - Barwon River Ovoid Sewer Aqueduct

Sheet Title: Existing Stair Plan and Sections

Scale at A1: NTS

Discipline: Structural

Drawing Status: **For Information**

Job No	Drawing No	Issue
280457	**1703-S-1201**	**P1**

7/07/2025 1:58:17 PM